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Note.—In the August No., page 155, article, "*Days of Grace*," occurred the following line: "the *drawers* failing, &c." It should have been *drawees*. "The stoppage of the New-Orleans House, Martin & Co., was caused by the *previous failure* of Lake & Co., in New-York, with whom ample funds had been placed to face all the drafts of the New-Orleans House.

☞ A quantity of most interesting Statistical matter, has been unavoidably crowded out, and will appear in the next.

THE COMMERCIAL REVIEW.

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I.—THE MONEY OF COMMERCE.

Political events in Europe are at this time producing singular and injurious influences upon the relations of all commercial countries. In the last thirty years, or since the peace of Paris, international communication has been rapidly extending itself all over the continent of Europe. The development of steam in boats and on iron rails has brought the remote countries of the continent into intercourse with the sea-board, levelled barriers to trade, and promoted that interchange of mutual production in which consists the actual commerce of nations. *Pari passu* with this progress, credit and commercial confidence have increased, and with the sale of merchandise, faith in the paper which represents its value has gained strength among the purchasers of produce. The individual promise of the buyer of goods has thus become the medium of payment for other purchases in distant regions, and the promise of an individual merchant has been received where that of a corporation would be rejected. The commercial principle thus developed, has gradually, in the scale of government, assumed a more potent voice, supplanting the old feudal military predominance of the aristocratic classes, and these have sought in general commotion the means of retarding the progress of the material interests of the masses of the people, because in that progress the ultimate inevitable destruction of all those privileges and distinctions which militate against the welfare of industry by detracting from its reward, is clearly recognizable.

As the commercial principle has developed itself, the precious metals have lost much of their importance, and they have therefore accumulated to an unprecedented extent in the great reservoirs of money, as the banks of Austria, France, England, and the United States. The returns of all these institutions show by analysis, that precisely in those years when prosperity is the most apparent and the amount of business done, or in other words, the quantities of the products of industry interchanged the most considerable, the idle accumulation of specie in the bank vaults has been the greatest. This results from the fact that international trade to be healthy, is of

necessity one of barter, and the more extensive it is, the less occasion there is for specie.

In illustration of this position we may turn to the commercial trade as connected with banking in the city of New-Orleans. It will be found that the influx of produce from the "great valley," as well as the foreign exports, have yearly increased in value as the bank loans have become more moderate, and the specie in the vaults greater in amount. This is indicated in the following table:

VALUE OF PRODUCE RECEIVED AT NEW-ORLEANS, OF FOREIGN EXPORT—IMPORTS OF SPECIE—THE AMOUNT OF BANK LOANS, AND THE SPECIE IN THE BANK VAULTS.

	Value of produce rec'd.	Foreign exports.	Total rec'ts. & for. exp'ts.	Imports of specie.	Banks.		
					Loans.	Circulation.	Specie.
1840....	———	32,998,059	....	....	41,711,214	6,443,788	3,163,243
1842....	45,716,045	27,427,422	73,143,467	....	48,101,210	1,979,039	1,504,661
1843....	53,724,054	26,653,924	80,381,978	10,407,371	31,695,439	1,248,652	5,858,857
1844....	65,863,866	29,443,734	95,306,690	7,727,323	5,180,230	3,023,378	9,915,052
1845....	57,199,122	25,841,311	83,040,433	2,249,138	6,180,230	2,556,891	6,162,080
1846....	77,193,464	30,747,533	107,940,997	1,872,071	8,130,240	4,213,318	6,657,622
1847....	93,033,256	41,788,303	131,821,559	6,680,050	8,400,699	3,709,053	7,578,510
1848....	79,779,151	39,348,722	119,127,873	1,845,808	6,232,359	3,963,689	7,590,655

In the years prior to 1842, there were 16 banks in New-Orleans, with affairs so extended that it was impossible for them to resume payments. Their loans had been made not in aid of commerce, but to facilitate speculations which had proved disastrous. The question of resumption was much discussed, and it was freely asserted that, if the banks called in their loans and withdrew their notes from circulation, there would be "no money." This was a bugbear held out to frighten the advocates of specie payments. The evils of a depreciated paper currency became, however, so apparent, that resumption in November, 1842, could no longer be avoided. The result was as indicated in the figures, viz. a return of paper for specie, leaving but a small amount of bank notes in the hands of the public, and but little specie in the vaults. The consequence was, that 10 banks were unable to continue their payments, while six have done so, observing a restrictive movement, up to the present time. Now it will be observed that the receipts of produce at New-Orleans, and the value of that portion exported abroad in 1848, together, are nearly double the amount for 1842; yet the loans of the banks are this year equal to only one-eighth of the amount due them in 1842, and the amount of specie they hold is more than double that of the bills out-standing. Now, we are further to take into consideration the fact, that the business of New-Orleans flows in from many states, all of which had large "bank accommodation" during the general suspension, as for instance, Louisiana, Missouri, Mississippi and Arkansas together, had bank loans amounting to $111,467,641, and the active loans in all those states together now reach $8,493,710 only; yet we have seen above that the value of their products arriving at New-Orleans has doubled, while the specie lying in the bank vaults has swollen to the sum of the loans. In these facts, we have the clearest evidence of the unimportance of *bank* credits to commercial prosperity. It may be stated, as explanatory of the above table, that the foreign exports, or portions of produce sent to

foreign countries, is the same produce that is received by the river, but it passes into other hands, and becomes the basis of distinct business operations, and moreover does not include the exports from New-Orleans to other states; as, for instance, the exports from New-Orleans for the year ending with June, amounted to $67,182,-323, of which $39,348,722, as above, was to foreign countries, and $27,833,601 coastwise. In relation to the bank loans, it is to be remarked, that the figures indicate only the regular business notes. The same institutions have loaned near $17,084,516 on mortgages, stocks, real estate, &c., being of the nature of loan office operations rather than of commercial banking.

The features indicated in the New-Orleans banks are also common to all commercial institutions, as seen in the following table:

SPECIE IN CERTAIN BANKS.

	England.	France.	New-York.	N. Orleans.	S. Car.	Ohio.	Total.
Jan. 1842.....	26,010,000	41,230,000	4,074,601	1,741,526	857,649	1,018,611	74,931,787
" 1843.....	54,665,000	43,182,000	6,174,317	4,586,737	817,131	524,076	126,405,820
" 1844.....	81,610,000	52,600,220	10,206,542	9,918,052	973.318	774,689	156,976 056
" 1845.....	70,920,000	48,965,048	6,893,236	8,138,987	901,176	819,100	136,627,545
" 1846.....	65,172,200	47,250.100	8,361,383	6,558,974	830,760	1,374,593	129,548,010
" 1847.....	72,130,240	14,913,967	9,191,254	6,345,316	643,841	2,026,551	105,251,167
Oct. 1847	43,900,416	17,732,810	7,418,928	6,192,376	860,435	2,604,446	74,710,951
Ap'l 1848.....	70,851,912	16,643,536	6,722,326	8,235,274	571,502	2,590,130	105,814,680
Jan. 1848.....	65,371,820	36,182,734	6,751,338	7,599,655	358,111	2,681,471	119,236,132

We have here the most extraordinary fluctuations. The largest amount held by all the banks was in 1844, and that was a year of general prosperity. The amount of specie then in the institutions being large, a less quantity was of course in circulation. In October, 1847, however, after the disastrous failures and loss of confidence in England, specie became in demand for use, and it left the bank vaults. It would seem, so far from an increase of commercial transactions requiring an increase of coin, as those would teach who hold that there is not specie enough in the world to transact the business without the aid of bank paper, that actually the increase of business throws specie out of employment.

From 1842 to 1844, the specie at these four points increased $82,000,000, coming out of the channels of circulation when business was active, commodities plenty, and their interchange by means of individual notes and bills of exchange unchecked by distrust. In 1846, the failure of harvests, by taking away one description of commodity, caused a demand for the precious metals for an extraordinary purpose, and the Bank of France underwent a drain so severe as to cause it to borrow £4,000,000 specie of the Bank of England. The continuance of this drain, arising from the same causes, brought the Bank of England nearly to ruin in October last. The reason of this was not so much the want of specie for the purposes of trade, as because distrust had fallen upon individual bills, and everybody, in all countries, wanted specie only. As the engagements outstanding were completed, and no new ones entered into, the demand for specie became less and less, and it continually returned to the bank, until the amount on hand is as large as at the moment of the greatest confidence. Thus a stagnation of business,

and a state of perfect confidence, seem to produce the same results, viz : to dispense with coin. The precious metals, therefore, act only in a moment as during revulsion, when nothing else would answer, and it is coming and going across the Atlantic at great expense, for no other reason than that other commodities are not available to discharge obligations, and promises cannot be trusted. It is to be remarked, that while the shortening of communications and the improvements in systems of trade are thus operating to lessen the importance of the precious metals, the supply of the latter is rapidly on the increase. The chief quarters whence they are derived now, are Russia and Mexico ; the former for gold and the latter for silver. The mines of Russia have already become so prolific as to have produced an important influence upon the affairs of nations. The large supplies that came opportunely to the aid of the Banks of France and of England at the moment of the crisis last fall, alone prevented that general explosion of credits in a state of peace that may now possibly grow out of a general war. The mines of Russia are in Orel, discovered in 1829, and in Siberia in the same year. The quantity produced down to the close of 1846, as expressed in the official journal of St. Petersburgh, and reduced to lbs. and dollars at the English mint price of gold, is 516,060 lbs., value $158,946,480.

The Russian pood is 36 lbs. avoirdupois, and the English mint price of £3 17s. 6d, is at an exchange of 4.80, equal to $308 per lb., giving the enormous sum here designated. The production of 1846, exceeding all former years, is $19,093,536, equal to 12½ per cent. of the product since 1829. Since 1843 she has produced $64,000,000 of gold, and the Bank of England has $20,000,000 more in its vaults. This vast increase of the gold products of Russia has been one result of the long peace, which has operated powerfully against the Russian staple exports, as hemp, iron, quills, duck, &c. The growth of hemp in other countries of Europe has competed seriously with that of Russia ; the development of the iron trade of England, has curtailed the demand for Russian ; quills have been extensively supplanted by steel pens ; and her exports of tallow have diminished under similar competition. All these causes have diminished the demand for the former products ; her industry, and the increased application of self-labor to the gold mines, is producing the results indicated in the above figures. The mines of Mexico have continued to send forth some $12,000,000 of silver per annum, feeding the circulation of France, where that metal is the standard, while England has been more than supplied with gold from Russia. In November last, the arrival of £1,000,000 in gold from Russia was the first opportune supply that flowed into the vaults of the bank. The large and increasing stock still held by Russia, and reported at more than £100,000,000, are a chief element in the strength which that power has acquired since the last war. In the last wars she bought gold of the Messrs. Rothschild for the supply of military chests. She now stands in the attitude of the source of supply for all powers. The continuance of peace would in a very short time have produced a very sensible depression in the value of the precious metals, by the double operation of their being less needed in commerce and greater in supply.

It results from what has here been stated, that all those theories of the credit system which assume that some species of paper money can be devised by which industrial commercial revulsions can be avoided, and commercial disasters averted, are based upon false premises. The actual money of a country, or of several nations, consists only in a very small degree of either the paper circulating as money, or of specie. It is really formed of all exchangeable products. So long as any country, or section of a country, has surplus products of its industry to sell, it has money. The Western hunter is not supplied with money from a bank counter, nor does he petition Congress to furnish him with banking facilities. Rifle in hand he plunges into the wilderness, and subsequently he appears with packs of furs that command cash in all markets. Thus every individual in the country, by producing some article of value, aids in furnishing a currency, because his surplus going to other nations is exchanged for just so much specie as is required, and no more. When this demand from any cause increases in magnitude, the production of gold is stimulated. Now it is very evident if the people of a country are not industrious, and produce no exchangeable wealth, that by no possible substitution of paper for coin can their wants be supplied. Ireland, as an instance, is occupied by some 8,000,000 persons. Of these, 5,000,000 occupy patches of land, and each raises as many potatoes as will with economy carry them through the year. The time spent in planting, hoeing, and digging those roots, completes the sum of his industry for the year; if we except such little jobs as are done in England, Scotland, and on the estates of the wealthy during harvest, to obtain as much money as will pay the rent of the patch which contains the year's food of the family, and which rent, by the system prevalent in Ireland, must be paid before the potatoes are dug. This has been the condition of Ireland. There has been no possible accumulation of property. With the consumption of the last potatoe of a crop, the entire products of a year's industry disappear. On such a people so situated, the potatoe rot fell, and there decayed in one week the only means of living for a whole year. With absolutely no property on the face of the earth to call his own, each cottar stands at his cabin door destitute and despairing. Is this the result of a bad paper money system, or the want of some well conducted bank? Clearly it is the result of long continued habits of unproductiveness. It is precisely the position of a North American tribe disappointed in finding game in its accustomed haunts. If in this case you supply them food, on their promise to pay "next crop," it becomes necessary that in order to pay they raise two good crops instead of one—an impossibility. All commercial revulsions resolve themselves into the same elements, and always arise from the primary fact that more has been consumed than produced. From want of a clear understanding of these general facts, in relation to what really constitutes money, much misapprehension prevails at times as to the causes of a money pressure, and this is particularly the case with that this year experienced in the Atlantic cities. In the usual course of trade, imported and

manufactured goods are sold on credit to the West, South-west, and South. As the crop year draws to a close, and the proceeds have been realized in the several sections, according to the nature of the local staple, the notes given for previous purchases of goods are liquidated. The city dealers, in realizing payment, discharge their own notes as they mature, and their deposites accumulating in bank form a fund, out of which the institution discount Southern acceptions, and enable millers and dealers to enter anew the produce markets. Whether money shall or shall not be abundant, depends therefore upon the extent of produce sales, as compared with the amount of goods sold to the interior. As a general thing the value of imported and domestic goods sold from Boston and New-York to the interior, on credit, will reach $400,000,000. Scarcely any portion of this is paid with money, but the individual paper given for it is cancelled by the credit arising from the produce and bills sent forward. The canals and avenues of trade carry down directly quantities of produce more or less considerable, according to the extent of the foreign demand. When that is large, not only is the quantity of produce brought down much greater than without it, but the prices rise so that the money value of all the sales, both for home and foreign consumption, is enhanced. In such a state of affairs, the amounts due the cities are promptly paid, the bank deposites accumulate, and money is abundant. This year the reverse has been the case—the sales of goods to the interior, as indicated in the canal returns, have been about 25 per cent. more than last year in quantity—while produce, which has come down, has been far less in magnitude, and lower in price. The consequence has been that the city merchants have with difficulty collected as much as would meet their obligations, and the deposites in banks have fallen to a low figure, leaving the institutions but small means with which to discount notes and acceptances, arising from the usual movement of the new crops. From these broad and general circumstances it is that the scarcity of money arises; more particularly that the amount of stock of the federal government held here is larger than the capital of the country will fairly warrant. The investments of money at the eastward in railroads have been very large, drawing severely upon the capital employed in commerce. And the same feature, in a lesser degree, has affected the New-York and Philadelphia markets, while from all of them in the last two years have been drawn unwonted sums for the use of the federal government. The following sums have in two years been taken by the federal government:

		Rate of Interest.	Payable.	Amount.
Loan of July	1846	6 per cent.	1856	$4,999,749 45
" January	1847	6 "	1867	12,890,372 00
" June	1843	6 "	1863	16,000,000 00
Treasury Notes	1846	6 "	——	409,860 00
" "	1847	6 "	——	13,128,650 00
Total in two years				$47,418,031 45

This has nearly all been drawn from the actual capital of the country, and expended in unproductive operations, in addition to

$9,000,000 which was in the Treasury May, 1846, making an aggregate of $56,000,000 drawn from the ordinary sources, on which various branches of industry depend for means, and used for unproductive purposes. By unproductive we do not mean of course that the lender does not get interest, but that the money expended and consumed in military operations has not reproduced exchangeable wealth, which is of itself capital, and which results from the employment of the money in manufacturing operations, or in the purchase of produce for foreign sale. In addition to the above, there has been $25,000,000 at least invested in fixed property, public works mostly. It is matter of just pride that our capital has proved equal to these demands without disaster, that the government has had its wants supplied without foreign aid, and that at a time when revulsions in England and revolutions in Europe have paralysed a large additional amount of our active capital; but it is evident in the heavy prices of stocks, the embarrassments of loan holders, and the rates they pay for money, while regular dealers encounter a severe competition in the market, that the financial capacity of the country has been severely taxed. In fact it could not have gone through the crisis but for the large amount of capital received from Europe in exchange for produce, which but for the failure of the English harvest would not have been available. The present pressure serves to check the investments of capital, while the prospect for the coming year is that such a further accession of capital from abroad will take place, arising from renewed demands for food, as will make good existing demands and again leave a surplus for all wants. We may reflect what would now have been the case in regard to the supply of capital had the government not taken from the market $56,000,000 in the last few years! If in the next two years the European demand for American surplus produce should equal that of the last two, we may confidently look for a permanent reduction of the rate of interest in our commercial cities. The price of money in London during the last six months has been 2 a 3½ per cent. per annum, and in the United States, under the borrowing of the federal government and of corporations, and an active demand for industrial purposes, it has been 6 a 7 per cent. with an occasional rise above that.

It is evident that what is usually called the "circulating medium," and which has been supposed to exercise so very potent an influence upon the welfare of commerce, has in reality, whether it consists of paper or the precious metals, but a very small influence upon the supply of the money market, since the discharge of national or sectional commercial debts depends not upon the quantity of money but upon the quantity of surplus exchangeable products of industry that they may have to export. Yet we find cliques of superficial financiers in all countries, since the time of the Mississippi scheme, constantly seeking to discover some mode of issuing promises which shall supply the wants of industrial productions, and prevent the disasters that inevitably follow over-consumption. The regulations of the Bank of England are of this nature; and it would seem that experience affords no instruction to those who adhere blindly to financial

theories. Under the charter of 1832 the Bank of England was confirmed for ten years, in its power of issuing notes to circulate as money on its credit, and this it did according to its avowed rule, in the proportion of three dollars of paper for one of specie on hand. In the ten years during which this renewal of charter had effect, many and severe revulsions took place from over-consumption of goods, losses in foreign investments, and by failure of harvests; yet these evils were mostly ascribed to the power exercised by the bank of issuing its promises on its *credit* to circulate as money, and in 1844 the power was taken from it. The charter of that year made a nominal separation of its affairs into "banking," and "issue departments;" the latter was to retain all the specie of the concern, and to issue notes, dollar for dollar, that is to say, it was required to receive all gold presented in exchange for notes, and to pay gold for notes whenever demanded. The banking department having no control of this matter, conducted its business of discount and deposite on the notes paid into it for government taxes and individual deposites, precisely as all other banks did their business. These provisions worked smoothly as long as government business was prosperous and exchanges were in favor of England. In 1846, however, the crops failed, and it became necessary for England to buy largely of foreign nations, while she both exported less, and produced less to export. It followed, that not only must her available capital in the shape of exchangeable goods and produce go abroad, but that in the shape of coin also, and the amount in bank fell from £15,000,000 to £8,000,000 in the year ending with October, 1847. The money market was therefore very tight. The effect of this diminution of coin in the banks was to decrease the notes held by the bank as a fund from which to discount. Now it was maintained that if the bank should be allowed to lend its notes on credit as before the change in the law, that it would remedy the evils resulting from a diminished export of goods, and a purchase of $150,000,000 worth of food extra. So seriously was this chimera entertained, that the government authorized the bank to violate the law, and lend its notes on credit. At this juncture, however, the import of grain having subsided, and goods again going forward for sale, merchants again began to collect debts and allow deposites to accumulate, making the market easy without any violation of the law. From that time money has been abundant in England, not because money, *per se*, is any more abundant, or that the mode of issuing it has changed, but because the consumption of imported goods has been less, and the production and export of exchangeable values greater.

The condition of France, from its long continued bad and extravagant government, which has, as a general policy, sought to prevent the improvement of the condition of the people in order to prevent the growth of their political influence, is very deplorable. For the last eighteen years corruption has been the means of government, and to make it effectual it has been necessary to draw almost all the earnings of the people into the hands of the central government with a view to its disbursement through official channels emanating from

the supreme head. Such a state of things has been ruinous to trade and industry. The government has drawn from producers annually, $200,000,000, to expend it upon idlers and non-producers; it has resulted that there could be no accumulation of capital by which to keep the people employed, or develope the national industry. Hence the extreme poverty and retrograde condition of the people. The new government recognizes the ruin, and acknowledges the necessity of improvement, but it has not yet discovered the true means of attaining the object. Great as was the expenditure of the Orleans dynasty, that of the Republic has been greater, amid shaken credit, paralyzed industry, and stagnant commerce. Some mode of relieving this pressure has been hoped to be discovered, and the National Assembly has been beset with paper money projects. Taught by the experience of the old revolution, the provisional government declared its determination not to resort to paper money, at the same time some of its members have since expressed their belief that it is the only resort. Paper money, as a means of taxation, is of a different character from the same instrument as a medium of commerce. In the former case it puts into the hands of the government, which issues it, the wealth of the people, without an increase of direct taxation. Thus, if a nation collects $100,000,000 taxes in a year in cash, it can issue 50,000,000 paper dollars to be received in return for taxes. By this operation it will have increased its resources to that extent. If it continues to use this resource, the paper will fall in value gradually as it is uttered, and being taken in trade passes from hand to hand, leaving a slight loss in each, until finally it passes out of existence as worthless. Almost every individual in the community will have lost something by the use of the notes, and government will have been well supplied, with less odium than would attach to raising the same amount of means by direct taxes. But the deleterious effect of this process upon the general trade is infinitely greater than that of direct taxes. The new government have therefore sought to avoid it, and to appeal to the good sense of the people to support the new order of things by taxes. To effect this, however, strict economy is a matter of first necessity, in order that the burden of taxation might fall as lightly as possible upon the industrious and holders of property. On the contrary, expenditure was increased, to pander to the passions of the dissolute, the idle and the turbulent, in order to purchase their support at the expense of the really valuable citizens. It has resulted that the latter were dissatisfied with a Republic which sought to maintain itself at their expense. The Republican members of the government seem to have felt the evil, and therefore advocated the use of paper money as a means of supplying the demands of one class without driving the other to resistance. The horrors of the old paper system are, however, too rife in the memory of Frenchmen, to readily allow of their reproduction, and many schemes have been proposed to "furnish a currency" for France, under the idea that by promoting the issue of paper upon private security, a ruinous depreciation may be guarded against. This would not permit of an issue by the government; but it is supposed that the abundance of such

money would promote the views of the government by making the payment of taxes more facile; that is, that it would raise prices, stimulate industry, enhance consumption, and, by swelling the sum of individual savings, lead them to contribute more freely to the wants of the state. This reasoning is based on the fallacy that it is paper money and not the successful production of real exchangeable wealth which promotes the welfare of commerce.

A bill has been introduced into the French Assembly to furnish a paper currency for France, in many respects like the free banking law of New-York, as it originally stood. The bill proposes that the government in Paris should issue, as money, bills from $5 to $200, to be made a legal tender, but inconvertible into specie, upon mortgages, of all real estate at three-fifths the value of the property, exclusive of mortgages. The loans to run for terms not over 15 years, and to bear 3½ per cent. interest. Every five years a new valuation of the mortgaged property to be made. This is in fact a proposition to turn the government into an immense loan office; the bills of which, issued on all the real property of France, to be legal tender each in the arrondissement of the mortgaged property. The value of real property in France is nearly as follows:

11,000,000 proprietors	$4,500,000,000
Mortgages, report of Director of Domains	2,065,000,000
Balance	$2,435,000,000

The new bill authorizes issues to three-fifths this amount, or $1,461,000,000—a very respectable amount of paper money. If this should be carried into effect to one-tenth of its capacity only, France would be flooded with paper money, which would operate to the repudiation of the present debt and the discharge of all debts upon real estates—as thus: The Director General of Domains states that existing mortgages amount to $2,000,000,000 on a specie basis; if the holders of mortgaged property apply for government money o this extent and pay off old mortgages, they would then have afloat as much paper money as would make all other debts worthless. This paper money it is proposed to make a *legal tender* and *inconvertible*. Hence a moderate issue will sink its value rapidly. The same bill authorizes the mortgagor to pay off in paper or specie when he pleases. Hence, for a little money, he will soon clear his debt to the state. The proposition is one for general spoliation of creditors, public and private. But as the money is not to be issued by the state for its own expenses, it will aid the finances in no other way than by facilitating the collection of taxes and virtually repudiating the debt. The interest the state will draw from loans will be indeed a revenue, as thus: If $2,000,000,000 is loaned at 3½ per cent. the state will derive $70,000,000 income, payable in this paper, which in such a volume would be of no value. A debt-ridden and tax-oppressed people like those of France must, sooner or later, acknowledge the utter bankruptcy, social and public, to which they have been reduced by a long series

of bad governments, and which in fact is the source of all the evils which now afflict them.

This plan has been supposed to assimilate to the New-York system of banking founded upon state stocks, which is, however, but a system of individual shaving in a small way, and in no degree affects the general abundance of money.

The legitimate object of banking, if it has any object at all, is for those possessed of money to lend it on favorable terms to those who need it in the furtherance of their business, and who pay the lender a fair rent for its use. The incorporation of banks had for its object the collection of many small capitals into a common reservoir, to be applied in the same way, the profits of the proprietors to grow out of the rent of their capital.

Inasmuch as that the furnishing of corporate paper promises to circulate as money has ever in the United States been persisted in, it has always been found that on the occasion of every pressure, the promissors failed, and the public were large losers by the outstanding promises. It was, of course, always necessarily the case that the loss fell on poor persons, because, as this money is used only in retail trade, those only are holders, who obtain it for labor or goods, to make small purchases. To guard against this evil became imperative, and in 1829, in the State of New-York, a law called the Safety Fund Act was passed. The leading features of this law were a requirement that no bank should issue more than twice its capital in bank notes, and that such bank should subscribe, annually, a sum equal to half per cent. of its capital, and these payments should, together, constitute a fund, out of which should be redeemed the notes of any bank which might fail. The immediate effect of this law was to promote confidence in the notes, and therefore to enable the banks greatly to extend their circulation. It is not necessary to follow the fortunes of the banks under this law; suffice it to state, that the circulation increased until general suspension resulted in 1837, by which all the bank charters were forfeited. The legislature thought proper, however, to legalize the suspension, on condition that the circulation should hereafter be restricted to amounts proportioned to capital, and less than the extent allowed by the safety fund act. As the limits of the safety fund act had never been reached by the actual issues, the wisdom of reducing the limit was not manifest. All the banks resumed in 1838, and so continued, until, in 1841–2, ten of them failed, throwing upon the safety fund a charge of $2,577,927 67. This was a sum far above the means of the fund, which was not only entirely exhausted, but all the contributions of the remaining 83 banks, up to the expiration of their charters, will be insufficient by $44,573 to discharge the demands of bill-holders for the banks already broken; hence, if any more fail, there is nothing from which to discharge their claims. The entire operation of the fund, from its commencement, to September, 1847, was as follows:

NEW-YORK BANK SAFETY FUND.

Bank contributions	$1,783,947 76	Bills of 10 banks	$2,577,926 67
For use of capital	41,669 78	Discount and interest, &c.	130,410 74
Stock issues on cr. of the fund	923,467 87	Money on hand	40,768 00
	$2,749,986 87		$2,749,035 41

There now remain 79 banks and two branches; and consequently their circulation, which in November reached $16,926,918, out of a total of $26,237,256, is utterly without any security.

The aggregate contribution of the safety fund banks, until the expiration of all the charters, will be $1,337,011 91.

In answer to a call of the New-York Senate, the comptroller states, that the present debt of the safety fund to the state, for state stock issued in its behalf, or to be issued for bank losses already incurred, is $980,352 47, payable at different dates, as far forward as 1866, when the last safety fund charter will expire. In the meantime, $441,949 41, interest, will accrue on said stock over and above what may be realized for interest on deposits to the credit of the bank fund—making the total amount to be paid by the fund $1,441,302 83. The whole estimated means of payment, including $1,337,911 91, to be received by way of contributions from the safety fund banks prior to 1866, inclusive, is $1,386,728 68—making the estimated deficiency for the whole period, $44,573 20.

In 1838, it had already become manifest that some further provision was indispensable for the security of bill-holders, and a general banking law was devised, by which any person or persons might issue notes as money, on depositing property with the comptroller to an amount equal to that of the notes wished to be circulated, and which notes were to be issued by the comptroller. At the same time the principle of not chartering or renewing the charters of any more banks was declared. This principle of making the notes issued a representation of actual property and not credit only, is sound. It is analogous to the nature of the individual bills, by which we have shown all wholesale and international business is conducted. The laying down of this principle by the legislature as the basis of future banking privileges, excited the cupidity of two powerful classes; one of them, the chartered bankers, saw in it the subversion of the special privileges they had hitherto enjoyed, and they determined upon its overthrow; as, however, the current of public opinion ran too strong for direct attack, they apparently fell in with the view, hoping to overthrow it by smuggling through the legislature, from year to year, amendments subversive of the principle of the original law, and this they have perseveringly done. No less than ten amendments have been passed, the effect of which has been gradually to restrict the operations of the free banks, and thus to operate for the general benefit of the public. The principle of neither granting nor renewing any more bank charters being incorporated in the new constitution of the state, all the present charters will expire before the constitution is again changed; consequently the whole business of banking, as far as the issuing of notes goes, must be conducted upon the principles of the general law, made more stringent

by reason of the efforts of the chartered bank interest to oppress its rivals. Since the enactment of the law of 1838, there have been two descriptions of money—the one safety fund, with no security whatever, and the other fully secured by the deposits of property.

The progress of the state circulation has been as seen in the following table:

FREE AND CHARTERED CIRCULATION OF THE STATE OF NEW-YORK.

	Safety Fund.	Free.	Total circulation.
1837	24,198,000	none	24,198,000
1838	12,432,478	none	12,432,478
1839	19,373,149	2,500,000	21,873,149
1840	10,360,592	6,012,000	16,372,952
1841	15,235,056	5,253,067	20,588,123
1842	12,372,764	3,642,437	16,185,201
1843	8,336,266	3,695,603	12,031,671
Nov. 1844	15,755,955	4,396,264	20,152,219
" 1845	15,831,058	5,544,311	21,375,369
" 1846	16,033,125	6,285,397	22,268,522
" 1847	16,926,918	9,310,338	26,287,256
March, 1848	14,391,504	8,656,522	23,047,826

The free banks have increased $5,000,000 since 1844, and the chartered but $1,000,000—a fact which has excited unusual activity on the part of the monopoly bankers. It is evident that the circulation is passing into the hands of the free bankers, and their circulation, based upon property, will become the only substitute for the precious metals in the retail channels of circulation. Before investigating the operation of these principles, we will sketch the position of the safety fund banks. We have seen, as above, that the chartered circulation is $16,926,918. This amount is issued by 79 banks and two branches, the aggregate capital of which is $27,941,460. The charter, which first expires, is that of the Merchants' Exchange Bank, in 1849, and the longest charter expires in 1866, except that of the New-York Dry Dock Company, which claims to be perpetual. The Manhattan Bank has also a perpetual charter, by virtue of which, it claims to be exempt from the regulations of the legislature imposed upon all other banks. These banks have had their circulation governed by three laws, that of 1828, in accordance with most of the charters, fixing the amount they may issue at double the amount of capital. The law of 1837 restrained the issues in the following proportions:

Capital of.	May circulate.	Capital of.	May circulate.	Capital of.	May circulate.
100,000	150,000	250,000	225,000	600,000	450,000
120,000	160,000	300,000	250,000	700,000	500,000
150,000	175,000	400,000	300,000	1,000,000	800,000
200,000	200,000	500,000	350,000	1,490,000	1,000,000
				2,000,000	1,200,000

This law reduced the aggregate issues allowed from $35,882,926 to 822,790,000, but it affected only country banks with small capitals, because the city banks and large country institutions can never get out even the lower amount authorized. In the last two or three years a considerable extension of banking business has been effected, and the chartered bank interest have

sought to produce an alteration of the law of 1837, in order that they may increase their issues. To this effect they alleged that the law of 1837, restricting the issues, was enacted without the constitutional majority. As, however, they depend on that law alone to exonerate them from the penalty of charter forfeiture, for the suspension of that year, they have not pressed the matter. At the last session of the legislature, however, they procured the passage of a law repealing the restriction of the act of the law of 1827, in respect of banks whose capitals exceed $200,000. The new law allows these institutions to increase their issues to the extent of their capitals; and the chartered circulation, therefore, is authorized by charters at $35,882,920; by act of 1837, at $22,790,000; by new law, $28,145,860, or double the actual circulation, which is $14,330,561.

In respect of this law of April, 1848, the chartered banks may be divided into three classes, viz: those in the city, having all large capitals, but which can never circulate but a small proportion of bills, for the reason that the country banks, being allowed to circulate their bills at a discount in the city, always usurp the channels of circulation; 2d, the country banks, of capitals of $200,000 and less; and 3d, those of capitals over $200,000. It is this latter class only that are affected by the new law, which was passed seemingly for their especial benefit and exclusive profit and enjoyment. The capitals and circulations of these three classes of banks, at the report of Nov., 1847, was as follows:

	Capital.	Circulation.	Circulation p. c. of capital.
City Chartered	$16,998,200	5,650,360	33
County and under $200,000	6,263,660	6,413,411	103
" over "	6,679,600	4,863,147	74
Total chartered banks	$29,941,460	16,926,918	

This inequality of circulation is the result of legislation. The permission to allow country banks to redeem their notes in the city at a discount, as we have said, enables them to usurp the place of the city notes at the expense of the people.

The banks with capital over $200,000 are 19 in number and their aggregate circulation, authorized by act of 1837, being $5,125,000, by new law $6,679,600, and the actual circulation $4,863,137, keep their limits full.

These banks can keep out in "fair weather" more than the allowance by the law of 1847, which was designed to prevent so great an expansion as would lead to revulsion. The new law removes the restriction, and permits an increase of 25 per cent.

The new state constitution, however, makes it the duty of the legislature to require "ample security" for the redemption of these notes, and the legislature *performs* this duty in the following clause:—

"It shall be the *duty of the Comptroller* to require, in addition to the contribution now made to the Safety Fund, of all banks asking for or receiving any bills or notes under and by the provision of this act, beyond what they are authorised to issue by the act of 1837, ample security, in accordance with article 8, sect. 6, of the Constitution of the State."

The responsibility is thus turned over to the comptroller; and the question turns upon what is "ample security." In a circular under date of May 2d, that officer acknowledges the vagueness of the requirement, but very properly says that the legislature specified what was meant by "ample security" in its requirements of the free banks. He therefore requires that when a chartered bank wishes an increase under the law, it shall deposite with him the same securities as are required by the new law in relation to free banks, viz: an equal amount of New-York 6 per cent. stocks, or one-half 7 per cent. mortgages on unincumbered real estate of not more than two-fifths of its value, exclusive of buildings. This is very just and proper; and in order to distinguish which bills of the bank are to be redeemed by these stocks, he requires that a particular plate shall be prepared for the new bills. Each bank will then have two descriptions of issues, one secured and the other not, as thus: the Rochester City Bank, as an instance, is, by the law of 1837, allowed to issue $300,000, and it has that amount out; the new law allows an increase to $400,000; should it issue these, it must buy stocks and pledge with the comptroller; it will then get $100,000 of a new plate, and when it fails, $300,000 of old issues will probably not be paid at all, and the new issues will alone depend upon the securities. But another difficulty arises; the safety fund charters contain the following clause:

"The said corporation shall not, directly or indirectly, *deal* or trade, in buying or selling any goods, wares, merchandise or commodities whatsoever, or in *buying or selling any stock created under* any act of the United States, or any particular state unless in selling the same, when truly pledged by way of security, for debts due to said corporation."

It is a difficult matter for a bank to "buy stock" to pledge with the comptroller for issues, without infringing this charter clause. The comptroller, however, thinks there will be no difficulty, inasmuch as that he supposes it never could have been the intention to prevent them from buying stock to secure their issues, and that if it did, the law of 1848 must be supposed to have modified the charter in that respect. This reasoning is very loose. When the charters were granted, no idea of securing issues with stocks was ever broached; consequently no "intention" could have had any relation to it. The law of 1848 does not specify any securities. The comptroller very justly, we think, infers a description of security from another law, but that inference does not nullify a charter enactment. The just conclusion is, that the law of 1848 is a nullity; it is utterly inoperative. The Constitution forbids further issues without "ample security." Acts of the legislature fully establish what ample security is, and the charters of the banks restrain them from giving that security; hence the new law is a dead letter, a bungling abortion of knavish speculators and stupid lawyers.

It has thus become, in a manner, a fixed principle of New-York legislation, that paper money must represent actual property, dollar for dollar. Behind each paper dollar issued must exist such sound property as will, beyond doubt, realize the specie to fulfil the prom-

ise on the face of a note the moment a banker fails to do so. This principle will ultimately be adopted in all the states, as has been the case in New-York. However, a severe contest will be carried on by the chartered banks to deceive the people and pervert the laws. It is, therefore, of the greatest importance that the matter should be fully and generally understood. The whole law, numbering 33 sections, embraces two systems: one of which, based on sound principles, is embraced in the first 14 sections of the act. The basis of this system is contained in the 2d and 3d sections, which we transcribe in full.

"SEC. 2. Whenever any person, or association of persons, formed for the purpose of banking, under the provisions of this act, shall lawfully transfer to the comptroller any portion of the public stock, issued or to be issued, by THIS STATE, such person, or association of persons, shall be entitled to receive from the comptroller an equal amount of such circulating notes of different denominations, registered and countersigned."

"SEC. 3. Such person, or association of persons, are hereby authorised, after having executed and signed such circulating notes in the manner required by law to make them obligatory promissory notes, payable on demand, *at the place of business*, within this state, of such person or association, to *loan* and *circulate the same as money*, &c.

The 7th section provided, that instead of making the whole deposite in stocks, one-half might be in six per cent. mortgages upon productive real estate, worth double the amount of the mortgage. The banker was to receive the interest upon these securities as long as his bills were in good credit, and fully covered by the securities. When the securities diminished in value, the interest was to be retained by the comptroller, or the banker required to surrender a part of his bills, or to deposite more stock. This was a sound principle.

We have said that two powerful classes were excited by this law project; of one, the chartered banks, we have already spoken; the other was composed of the speculators. It is known that land speculations had run to an extraordinary extent in the few years preceding the revulsion of 1837, and that vast quantities of real estate and worthless mortgages were held at high prices by persons who sought some means of realising. This banking law was fastened upon as that means, and the door thrown open to ceaseless frauds by giving greater latitude to the provision. The 15th section of the law provides as follows:

"SEC. 15. Any number of persons may associate to establish offices of discount, deposit and circulation, upon the terms and conditions, and subject to the liabilities prescribed in this act; but the aggregate amount of the capital stock of such association shall not be less than $100,000."

The phraseology of the first section was, "persons or association of persons," and those sections specified only the manner in which the notes were to be secured; to be payable at the place of business, and "*loaned*" as money. Commencing with the 15th section, the phraseology is "company," "association," and "persons." The liberty to form capitals applied to associations only, and not to

the individual banker. By this means the most absurd speculations were engendered. Holders of sham mortgages associated, valued each others property, deposited certificates, and became a "bank." On the credit of being thus an established bank, they were enabled to purchase the stocks of the western states—these being pressed upon the market. These stocks were deposited with the comptroller, and the bills he issued upon them were often the only real money of the concern.

As an indication of the mania which resulted from these provisions, we may state, that of hundreds of banks projected, sixteen only proposed capital, the aggregate of which was $487,680,000.

It is evident from this fact, that "small ideas" were not prevalent in the community on the subject of banking at that time, and that experienced bankers and old merchants were those who headed the delusion. The practical part was, however, for holders of real estate unavailable from the bursting of the great speculations of recent years, to turn that property into bank shares, and thence into money. This was the basis of the movement. Of all the above banks, the Mechanics' Association and the American Exchange Bank alone remain. The proceedings of the remainder were as ridiculous as their pretensions were preposterous.

This working of the law induced, in 1840, an amendment, making New-York stock equal to 5 per cent., alone receivable as securities, and bonds and mortgages for an amount not exceeding one-half of the whole amount of securities, and to an extent not greater than one-half the value of the land. This, by a new law, passed April, 1848, has again been restricted, and the stocks must now be equal to a New-York six per cent. stock, not to be taken over par, or at more than the market value, and the bonds and mortgages in amounts not greater than $5,000 each, bearing 7 per cent. interest, and to an extent not greater than two-fifths the value of the unincumbered land, exclusive of buildings. This regulation doubtless increases the security of the bill-holder, while it at the same time restrains the movements of the bankers. These restraints could not, however, have passed, were it not for the desire of the chartered banking interest to oppress the new system; but, by a happy retribution, they have in some degree fallen into the pit themselves, inasmuch as the comptroller has, as above described, ruled that under existing laws, if the chartered banks wish to extend their circulation, they must comply with the same terms of security for bills.

In the working of the free banking law thus far, it would appear that 139 banks have been started under it. Of these, 88 are in operation; 21 have been closed by their proprietors, without loss to the bill holders, and 30 have been closed by the comptroller. Of these, 25 have been settled at 76 per cent. average.

It appears that the radical errors that have been discovered in the working of the law, are, 1st, that the securities were not restricted to the stocks of this state, or the United States; 2d, that a sufficient margin was not allowed for a time of pressure, when alone the securities would require to be sold. Instead of giving dollar for

dollar, no more than $90 of bills ought to be delivered for $100 of stock. 3d. In taking mortgages, power ought to be by law conferred upon the officer to foreclose and sell on the spot, with recourse to chancery. 4th. Mortgages should be in small sums, readily brought within the means of capitalists; and 5th, the redemption should be rigidly enforced at the actual place of business.

Under this law, however, the whole operation has run into an abuse of another nature. By its means, individuals obtain an income by borrowing of the public, not paying an interest for that which they borrow, but charging the public an interest. Thus, an individual with a small capital—say $5,000 or $10,000—purchases therewith stock, and deposits it with the comptroller, who issues an equal amount of circulating bills. These bills are disbursed in the purchase of more stock, and the operation repeated until there are some fifty to sixty thousand dollars deposited, and an equal amount of bills in circulation as money. These latter are suffered to circulate at a discount, and are redeemed by the promissor or his agent, at ½ a ⅜ per cent. discount. The profits of this redemption pay the whole cost of the operation, and leave the proprietor in the full enjoyment of $70,000 of New-York six per cent. stock, or $4,200 per annum. The manner in which banks are got up is fully elucidated in the detailed statement of the affairs of the Pratt Bank, investigated by the comptroller. Mr. L. F. Tiffany is the owner, having purchased the concern, that is, the state stock pledged with the comptroller, and fixtures, of Mr. Pratt, in April last. The whole means of the bank are as follows:

Capital.		Appropriated.	
Consisting of the note of		L. F. Tiffany's note	$20,000 00
L. F. Tiffany	$20.000 00	" "	6.454 45
Borrowed by circulation	49,995 00	In Patchin Bank	11,783 73
" of state of N. York	20,630 98	New-York State Bank	50.000 00
" of individuals	17,372 98	Other accounts	16,382 76
		Bank Notes	2,940 06
		Specie	474 30
Total means	$108,048 86		$108,048 86

In addition to the above, $26,454 45, Mr. Tiffany is endorser on a note of Henry Randall for $1,500. The result is, that this banker has collected a focus of credits, out of which he has obtained $6,454 45 more than the amount of his own note, which constitutes the capital of the bank! $474 specie to meet $49,995 circulation, being 100 to 1! The commissioner attempts to explain why Mr. Tiffany lets a balance of $11,000 remain with the Patchin Bank, but says nothing of $50,000 with the State Bank. The probability is, that instead of that sum being due FROM the State Bank, it is actually due TO that concern. It is probable that the bank advanced the stock to lodge with the comptroller for the $49,000 of circulation, and of course $50,000 is turned over to it out of other borrowed funds.

Very similar in results is the legislation in Ohio upon this subject.

The Ohio bank law of 1845 authorizes 75 banks, of which nine were old banks, including the bank of Wooster, recently exploded. It therefore authorized 63 new banks with aggregate capitals of $6,150,000, and circulation, $12,291,000. The 75 banks authorized, have two modes of organization laid before them; viz., as branches of "a State Bank of Ohio," or as "Independent banking companies," on a plan something similar to that of the free law of New-York; a common provision which applies to both plans is, that before commencing business, 30 per cent. of the capital shall be paid in, in specie or specie funds; one-half, or 15 per cent. in "gold and silver coin;" and moreover, it is provided that this 15 per cent. of gold and silver coin "shall at all times be on hand." If the ratio of 15 per cent. shall be diminished, the bank to cease doing business, except to purchase sight bills of exchange until it is made good. This *keeping* of 15 per cent. of specie *on hand* has been tried in New-York, in Alabama, and elsewhere, and its gross absurdity always made manifest. Of what use is it that a bank has the gold and silver, if the law forbids it to part with it? To comply with the terms of the law, the bank must have at least 30 per cent. in specie, 15 per cent. for use, and 15 per cent. *to keep* according to law. The 56th section, however, removes the difficulty entirely, as follows:

"Sec. 56. Actual deposits with any solvent bank or banker, of established credit in the cities of New-York, Boston, Philadelphia or Baltimore, subject to be drawn against at sight, in gold and silver coin, shall be deemed equivalent to gold and silver coin whenever used in this act."

Hence, if a bank pays out its notes for a draft on either of these cities, that draft is *gold and silver coin.* Thus, if the circulation is $90,000, and the specie reserved is reduced to $10,800, the bank has only to pay out its notes for a New-York draft of $5,000, that *draft* being *gold and silver coin* within the meaning of the act, it will have $15,800, or 16 per cent. on hand, and its quota more than restored. On this basis, when seven banks were formed, intending to do business as branches of the "State Bank of Ohio," they were to organize, and each to appoint one person to be a member of a "board of control." This "board of control" locates itself at Columbus, elects a President, and becomes incorporated as the State Bank of Ohio. The members fix their own salaries, each representing one branch, and having a vote for every $50,000 his branch has in circulation. The basis of representation are, therefore, the promises of his constituents; the more they promise the more power has he. This board is empowered to investigate and examine all the branches, reduce the circulation, if necessary, &c. Now the place of each member is dependent upon the bank that appoints and pays him. Yet this appointed and *paid servant* is constituted a supervisor over his employer who pays him. It may well be supposed what kind of a board of *control* that is which is dependent for its existence upon those whom they are to control. It must resolve itself, as was probably intended, into a mere whitewashing committee, to cheat the public by standing between it and those banks which *employ* the "*board of control.*"

This "board of control" is to furnish the circulation when 10 per cent. of the required amount shall be deposited *in money* or stocks. Here again *money* means "Eastern kites." If a bank wants $10,000 circulation, it sends the requisition to its agent, accompanied by a draft on New-York for $1,000. This by the law is "gold and silver coin on hand." If the board of control have not sense to see it in that light, the banks will appoint those that have in their places.

The stockholders of these banks are not to borrow more than one-third of the capital directly, and one-sixth as endorsers, making one-half. That is, two stockholders owning $3,000 each, may have a discount of $1,000 as makers each, and $1,000 more between them as mutual endorsers. This is indeed an improvement, because some directors have been known to borrow more than the whole.

The affairs of the Bank of Wooster, recently failed, afford a good illustration of the manner of organizing these concerns. Mr. J. S. Lake was formerly canal commissioner, and became the largest stockholder in the Bank of Wooster, an institution never in good repute, and which was on the point of failing three years ago, together with the Norwalk and Sandusky banks, in connection with the exploded bubble, called the Bank of St. Clair, Michigan. The capital of the Wooster Bank was $249,450; of that there stood in Mr. Lake's name $171,900. Mr. Lake then moved to New-York, and commenced business as a broker, under the firm of J. S. Lake & Co., in Wall-street. The Co. was his son-in-law, O. Klemm, who was doing business in Cleveland, under the firm of O. Klemm & Co., the Co. being J. S. Lake, in New-York. Klemm was also cashier of the bank. These gentlemen performed all the business of the bank, that is to say, Mr. Klemm purchased with its means eastern drafts, and sent them to Lake for collection. Lake making his returns occasionally, the other directors knowing but little of the transactions. The amount of funds in the hands of these gentlemen were as follows:

Bills of exchange, with J. S. Lake & Co	$89,759	
" " O. Klemm & Lake	50,428	
State stocks, with O. Klemm & Lake	57,665	
Other assets " "	342,188	
Total with Lake & Co		$540,000
In bank, specie and notes of other banks	$92,560	
Real estate	19,244	
Total in Bank	116,925	$228,729
Total assets		$768,729
Circulation	$162,228	
Deposits	30,175	$492,403
Capital, &c		$276,326

With this large amount of the means derived from the Wooster Bank, Lake & Co. speculated in produce, on which they acknowledge a loss of $150,000, and they *started three other Ohio banks, besides buying the Mineral Bank of Maryland and a bank in Texas.* The last returns of the three Ohio banks, were as follows:

	Discounts.	Specie.	Circulation.	Deposits.
Canal Bank, Cleveland	$76,512	15,026	51,678	40,439
Bank of Akron	247,238	63,373	200,000	56,526
" Toledo	322,506	65,741	222,500	59,961
Total	$646,256	144,140	474,178	156,926

The Canal Bank is an independent bank, and the other two are branches of the State Bank. The law of Ohio requiring the independent banks to deposit with the state treasurer stocks to cover the circulation, and the law calling eastern paper gold and silver, the specie in these returns probably means Lake's paper; we now observe that the foundation of the whole is $171,900 of stock owned by Lake in the Wooster Bank. It is possible that not a cent of money was ever paid at all, but stock notes given. The Bank of Wooster borrowed, it appears, of the public, mostly of poor people, on small bills, $492,403, and Lake & Co. held $540,000 of this money, borrowed of the farmers, through the agency of a bank, or they had $369,000 out of the bank more than they professed to have put into it. Included in this $540,000 was $57,665 Ohio state stock. This was deposited with the state treasurer, as a basis for the Canal Bank of Cleveland, and $51,678 more notes issued to the public for it. With the other funds the Akron branch and the Toledo branch were started, and $422,500 more notes issued to the public, besides the issues of the Texas and Mineral Bank. Here, then, Lake & Co. had borrowed of the public on small notes through four banking machines, one laying the foundation of the other, $936,398. For these issues they obtained large quantities of produce of the farmers, on which they met with disastrous losses, and the notes cannot now be redeemed. We have thus entered into details in order to illustrate the whole operation of this bubble banking.

Now, there is nothing whatever in this Ohio State Bank system to prevent the enactment of the same scenes which in 1838–'39 were presented under the wild-cat system of Michigan. It is the most absurd piece of charlatanry with which a community were ever insulted. A bank may go into operation on $30,000 of "kites," with a nominal capital not less than $100,000, and when 60 per cent. is paid in the "board of control," its own paid agent may release it from paying in the remainder. It may then proceed to push out its promises to any extent, and in active competition with other issues. There are now *five* of these banks *owned by* one money broker in Wall-street, New-York.

This State Bank is composed of branches, the progress of which has been as follows:

OHIO STATE BANK.

	No. branches.	Capital.	Circulation.	Specie.	Loans.
Feb. 1846	16	998,374	1,388,066	470,642	2,000,464
May. 1846	16	998,374	1,822,435	618,049	2,423,779
Nov. 1846	17	1,496,757	2,655,346	819,820	3,254,146
May. 1847	22	2,070,743	3,678,931	1,080,467	4,812,772
Nov. 1847	28	2,657,567	4,674,075	1,522,902	5,717,251
Aug. 1848	37	3,302 090	5,633,322	1,994,937	7,021,933

The "board of control" or "State Bank," it appears, is now

composed of 37 delegates sitting at Columbus, each appointed and paid by the bank he "controls;" and the less he "controls" them the greater number of votes he has. For instance, the Akron bank, in Feb., 1846, circulated $22,306 notes, and its delegate had one vote. Under the operations of Lake & Co. the bank raised its issues to $200,000, Feb., 1848, and the same delegate had, in consequence, four votes. This increase of his influence at the board did not induce him to "control" the source whence it issued. Such is the bubble which has been supposed a check upon banking abuse in Ohio.

All these operations are called "furnishing a currency," and in some quarters the practice is defended on the ground that it is "free trade in banking," and that legislative interference will not remedy the matter. Now, the general principle so advanced is a correct one, viz.: that these things should be left to regulate themselves. But the application of the principle in relation to these banks is unsound, inasmuch as that they have their origin in "regulation." The state undertakes to endorse, as circulating money, the promises of an individual who will deposit stock with the comptroller. This elevates the character of, and gives currency to, the promises of an individual who, left entirely to himself to be "regulated" by the "laws of trade," could obtain no general circulation for his promises any more than the possessor of any other property. These promises are then used solely and simply for the use and behoof of the individual at the expense of the public. This is not free trade in banking; it is simply giving an annuity to an individual. The laws of nature and of trade are those only which should be trusted with the "furnishing of a currency." Mankind, by a common consent, have adopted gold and silver as currency. By a singularly wise provision of Providence, the quantity of these metals furnished from the mine, being governed by the value of labor, keeps pace precisely with the wants of the world. Each nation obtains its share according to the enterprise and industry of its citizens. The quantity brought into a nation by its industry and commerce, always suffices for its wants, and its government affixes simply a stamp upon it to designate the uniform quantity of the metals in each piece. Having done this, "the currency is furnished." The wants of commerce are then supplied by the notes and bills of individuals in good credit, based on actual transactions, circulating within the immediate sphere of the transactions on which they are based, and within which the makers of the notes and bills are generally personally known to those who are called upon to take them. These bills and notes constitute the real currency of commerce, and should be left entirely free. The state legislature then, in their wisdom, undertake to create another species of currency, having no relation to trade, not being the result of industry, and in no way forwarding the general welfare. This they do, by authorizing an individual to buy stock for his own emolument and enjoyment, on the credit of false moneys issued by him, and to which the state fixes the stamp of legality, in order to give them a currency they would otherwise no possess.

Art. II.—SUGAR MANUFACTURE.

MEANS RESORTED TO TO EXTRACT THE JUICE FROM THE CANE.—SUGAR-MILL.—QUANTITY OF JUICE OBTAINED UNCERTAIN.—HYDRAULIC PRESS.—SLICING AND DRYING OF THE CANES.—MICHIEL'S PROCESS.—RESULTS OBTAINED BY MILL INCREASED BY CARE AND ATTENTION.—FIVE-ROLLER MILLS.—FOUR-ROLLER MILLS.—WANT OF ECONOMY IN THE EMPLOYMENT OF MEGASS AS FUEL.—MOTIVE POWERS APPLIED TO SUGAR-MILLS.—DEFECTIVE CANE-JUICE.—ITS IMPERFECTIONS.—FILTRATION.*

THE period of the year has arrived when the canes are to be cut, and their saccharine fluid expressed, that it may be converted into sugar. The preceding efforts of the planter are now to be tested; they are about to assume that form by which their value is to be estimated, and on the quantity and quality of which his profit or loss for the year will depend.

That it is the interest of the planter to obtain the largest possible amount of sugar from the canes appears to be so obvious, that we can scarcely suppose that a doubt could be expressed respecting it.

But does the planter of the present day so consider it? Does he believe that the object for which the canes have been cultivated at so enormous an expense, is that of obtaining sugar from them exclusively?—or has he overcome so many difficulties in bringing them to maturity, that he may employ them for some other and ulterior purpose? These questions will be answered presently.

I must, however, at once declare that his sole consideration, after having obtained the canes in the most perfect condition that circumstances have permitted, ought to be the means to which he should resort for extracting their saccharine constituents in the greatest abundance, and in the greatest purity.

The fluid contents of a cane form 90 per cent. in weight of the entire structure of the stem; they consist of water, holding in solution a large quantity of crystallizable sugar, and a small amount of other substances, the presence of which would prove highly injurious if not removed shortly after the vitality of the plant has ceased. The remaining ten parts constitute the woody tissues of this portion of the plant.

It has likewise been shown, that it is highly probable, if not certain, that during the life of the cane the various substances which enter into the composition of its juice are never found mingled together, but that sugar and water alone form the contents of the cells, whilst the others are found in solution in the sap vessels exclusively.

The anatomy of the sugar-cane teaches us, that to obtain these two fluids separately, is altogether impracticable; nevertheless, we

* Continued from August and September Nos.

may inquire whether the *whole of the sugar* can or cannot be obtained in a state, more or less free from an admixture with the other substances, by means which are applicable to the manufactory, as we have seen that it can be effected in the laboratory of the chemist.

The means at present resorted to, or which have been proposed for adoption, to extract the saccharine matter from the cane, are the following :—

1*st. The Sugar Mill.* This is the mode universally employed in all the colonies for extracting the saccharine constituents of the cane. The construction of the mill is too well known to require description. It may be sufficient to say, that it consists essentially of three rollers, which are placed sometimes in a horizontal, and sometimes in a vertical direction.

The canes are submitted to the action of these rollers; and, in consequence of the great pressure and squeezing which they undergo, the whole of their tissues are completely broken up and lacerated. The degree of pressure is always so managed, however, that each cane shall, as far as possible, be drawn from between the rollers, preserving its entire length, so that it may the better serve the purpose for which it is ultimately destined, namely, that of fuel, by the exclusive means of which the sugar of the following year is to be manufactured.

Cane-juice, thus obtained, must necessarily be a very heterogeneous fluid, comprising not merely a varying amount of all the soluble substances which enter into the formation of the plant, but also of much solid and insoluble matter likewise. The latter consists, for the most part, of cellulose and woody fibre, of earthly particles which have adhered to the cane, of green coloring matter, &c., and which are easily separable by filtration.

We possess no information by which we can ascertain the precise amount of the fluid thus obtained from 100 lbs. of canes in the British sugar-growing colonies. I have questioned many planters upon the subject, but always without success; and my own observations have been too limited in their extent to deserve much weight as an authority.

Fortunately, we have other sources of information which, by enabling us to learn the results obtained in foreign but neighboring colonies, furnish us with data for arriving at a knowledge of those obtained in our own.

Three or four years ago, M. Duprez, pharmacien in the French marine, was sent by his government on a special mission to Guadaloupe, for the purpose of making a series of experiments on the composition of the sugar-cane. This gentleman, attaching a just importance to the quantity of cane-juice which is ordinarily obtained from the canes, details a number of experiments which he performed on this point on various estates throughout the island. The weight of canes in each trial varied from 200 lbs. to 12,000 lbs., and the average amount of juice furnished by 100 lbs., crushed in the different mills, was as follows :—

1. By mills having horizontal rollers; the motive power not stated,..... 61·2 lbs.
2. By mills; motive power, steam, ... 60·9
3. By mills; motive powers, wind and steam,..... 59·3
4. By mills having vertical rollers,..... 59·2
5. By mills; motive power, cattle, ... 58·5
6. By mills; motive powers, wind,..... 56·4

He further states, that although the quantity of cane-juice varied 68·5 to 54 per cent., the average of his experiments was 56 per cent. only.

M. Avequin gives 50 per cent. as a general average of the juice expressed from canes in Louisiana, while M. Senez states that he only obtained 36 per cent. of cane-juice, by means of a mill worked by steam. M. Paul Daubrée, in a pamphlet, the translation of which, by Mr. Thompson, of Jamaica, is, I believe, generally known among planters, considers 50 per cent. as a full average expressed by the mills throughout the Island of Martinque. The lowest amount that my own observation in the West Indies permits me to give, is 47 per cent., and the highest, 61 per cent.; but, as I have just mentioned, it has been too limited to be offered as an authority. In the Island of Madeira, I obtained at two different times by the same mill, and from canes of similar character and quality, 47·5 and 70·2 per cent. of juice. The mill was a small one, made at Aberdeen about two years previously, on the ordinary principle, with horizontal rollers, and the motive power was cattle. During the experiment, which furnished the last and largest result, the rollers were braced more than usually tight, and the number of canes introduced at a time were five or six, being the utmost that the strength of the cattle would admit of. The canes were squeezed once only; indeed, the megass was too much lacerated to admit of its being passed between the rollers a second time with advantage.

There is a considerable difference, as we may perceive, in the results given above, but this difference does not excite so much surprise as the comparatively small proportions of cane-juice, which appear to be obtained as a general average in those countries in which this matter has been investigated.

How far these results correspond with those which would be obtained by a general and strict inquiry being established throughout the British colonies, it would be idle even to surmise; but there is every reason to believe, that the comparison would prove an unfavorable one to the latter. Many reasons lead me to believe:—1. Because we can scarcely expect to find superiority, or even equality, where no attempts have been made to obtain it. 2. That when we are ignorant that a deficiency exists, little pains will be bestowed to correct it. 3. When, from the force of circumstances, more attention is paid to the obtaining of an abundant supply of megass, to serve as fuel for the concentration of the cane-juice of the following year, than I, at least, have ever seen evinced for obtaining a full and adequate supply of juice for the present.

Let it not be supposed from the above remarks, that I consider that the French planter possesses a more extended knowledge of his

art, greater acquirements, or more industry than his English *confrère*. I should be sadly unjust towards my countrymen by such an insinuation. I have had opportunities of appreciating the qualities of both, and unhesitatingly acknowledge, as a general rule, that both as agriculturists and sugar-boilers, the latter are superior. But this admission does not invalidate what I have just stated; for, attention having been drawn to this subject in the French colonies in a very remarkable degree, it has received far more consideration there than it has in our own possessions.

The due and efficient expression of the juice from the cane is a subject of the very highest importance, for it is evident, that upon this cause alone may depend the fortune or the ruin of a proprietor of a sugar plantation.

2. *The hydraulic press* has been proposed as a substitute for the mill, and as a better means of expressing the cane-juice. It has been itroduced into Jamaica and St. Vincents, but with what success I am unacquainted. I know not whether it has ever been submitted to a fair trial, and the results obtained by it compared with those obtained by the mill.

Unfortunately, there is no organised system as yet established among the colonies, by which the knowledge and experience of one may be diffused among the many. From the want of the means of reciprocal communication, repeated and well ascertained failures of a scheme, which have caused its rejection in one colony, do not prevent frequent and renewed trials of it in others. Or, if it has proved successful, ignorance of its success, aided most probably by a scepticism which has been rendered obstinate from witnessing repeated failures, causes a long period to elapse before its reception becomes general. Thus it may have been with the hydraulic press. May not its more general employment have aborted for some similar reason?

3. It was proposed a few years ago to cut the canes into thin slices, which were to be dried, either in the sun or by means of artificial heat, and then forwarded to Europe for the purposes of manufacture. This scheme was tried in Guadaloupe, and, as might be imagined, failed. Decomposition of the canes commenced on board ship, and on arrival in France, the whole of their sugar was destroyed. Moreover, if they had arrived in a perfectly sound state, the trouble and expense attending the operation of slicing and drying, coupled with the additional freight, render it questionable whether the scheme would have been remunerative.

4. A few months ago, a patent was taken out for the French and British colonies, by M. Michiel, for extracting the sugar from the cane by an entirely new process. It consists in cutting the canes into extremely thin slices, and then submitting them to the action of a mixture of lime and water, which, it is presumed, will coagulate, and render insoluble the whole of their nitrogenized constituents; thus permitting the extraction of the whole of the sugar with the soluble salts by means of water.

Were this process as practicable as its admirers seem to think, it

ought, unquestionably, to be universally adopted; for I believe that were it skilfully carried out, almost the whole of the saccharine matter in the cane would to a certainty be extracted. It remains, however, to be seen whether it is really so practicable, or whether its application will be sufficiently cheap. I much fear that the circular knives, by which the canes are to be sliced, if we may judge from what occurs in the slicing of the beet-root, will be subject to continual derangement, and their edges blunted by the silicious coating of the cane. It may be doubted whether the operation will prove a sufficiently speedy one to admit of its adoption on large estates. The amount of evaporation demanded would also be great. This, it is true, may be obviated by placing the canes thus sliced, in a succession of boxes having perforated bottoms, and placed one over the other in such a manner, that boiling water poured into the upper one will gradually percolate through each of the subjacent ones, and thus, by robbing the canes successively of the greater portion of their sugar, the saccharine liquid will become gradually more inspissated as it descends, until, when it comes away from the lowest box, it will have assumed the state of a syrup of considerable density.

I offer the above remarks, frankly, because I think that this scheme presents much that is admirable; nevertheless, like many others, it requires the touchstone of experience.

After all, it must be admitted, that at the present time, the only means which have been sufficiently tested to give us the confidence we have a right to demand, for obtaining the saccharine fluid from the cane, is the mill. We must, therefore, attempt to the utmost of our power to correct, at least in some measure, its present imperfections, or rather the imperfect results obtained by it.

I have shown that from a more tight bracing of the mill, the quantity of cane-juice obtained from 100 lbs. of canes may be augmented from 48 lbs. to 70 lbs.; but it is evident, that to effect this increase, a corresponding augmentation of the motive power will be required.

Our present inquiry is confined to the means to be adopted to render the mills already erected more effective than they are generally found to be. The improvements in their construction, and the application of the most advantageous motive powers, will be considered hereafter.

To render a mill as efficient as possible, the following rules should be attended to:—

1. The rollers should be made to approximate as closely as the work which they have to perform will admit of. In mills, in which the rollers observe a vertical direction, the space between the first and second should scarcely, if at all, exceed $\frac{1}{4}$ of an inch, whilst a distance of $\frac{1}{6}$ of an inch is the most that should be allowed between the second and third. When they are placed horizontally, the upper one ought to observe a space of $\frac{1}{5}$ to $\frac{1}{4}$ of an inch from the two lower. These distances can never, perhaps, be accurately given in every case, but the requisite degree of bracing should always be

strictly attended to. 2. The velocity of the rollers should be rendered as uniform as possible, not by diminishing the amount of the motive power, but by a carefully regulated supply of canes. 3. The canes when thrown upon the feeding-board should be upon the same plane, and never suffered to cross each other, otherwise the motion of the rollers will be checked, and the canes will be submitted to unequal pressure. 4. The megass should invariably be repassed between the rollers, so as to extract, as much possible, the juice which still remains in it.

When the canes are rich, and their juice of considerable density, the megass should be sprinkled with a little water, or, where it is practicable, exposed to the action of steam before it is submitted to the pressure; but when the canes are large, green, and watery, this may be dispensed with.

By following the foregoing rules, the quantity of cane-juice may be increased, at least, 20 per cent.; that is, a mill which ordinarily gives 50 lbs. of juice for every 100 lbs. of canes which are crushed by it, may, by a little attention, be made to increase the quantity to 60 lbs. at least, and the one which now produces 60 lbs. may be made to yield 70 lbs. from a like quantity.

This amelioration may be obtained without any additional outlay of money; a little watchfulness on the part of the planter, to see that his orders are carried out, being all that is required for its accomplishment.

There are, unfortunately, many mills, which, either from age, the want of solidity originally, or from a construction altogether imperfect, produce even an inferior result to those given above. A comparative amelioration will follow the application of these rules in all cases; but the only real amelioration which can be effected in the cases alluded to, is the removal of the old mill and the erection of a new one. The present, it is true, are not the times when sugar properties in the West Indies permit an indiscriminate outlay of capital for the purchase of new machinery. But it must be remembered, that the difference between 45 or 50 lbs. and 70 lbs. of juice, extracted from equal quantities of canes, indicates a corresponding difference in the amount of the crop; while the annual expense attending the cultivation of the estate, would be in both cases the same. If the erection of another mill be decided upon, we may inquire into the principles that should guide us in its selection.

One evil attending the mill composed of three horizontal rollers, is the re-absorption of a part of the cane-juice by the squeezed, but spongy megass. Another and much greater one, is the loss of power caused by the oblique direction of the crushing force, and the inordinate amount of friction.

Mills have been within the last few years manufactured with five rollers, which are placed with regard to each other, in the same manner as are the three rollers in the usual horizontal mills—that is, two are placed above and three below. Mills thus constructed, have been successfully used in Cuba, Bourbon and the Mauritius, 70 per cent. of juice having been obtained by them at one operation, with-

out much greater laceration of the megass than is usually produced by the three-roller mill. But, as might be foreseen, a great objection has been raised against them, owing to the very considerable increase of motive power which they require.

Latterly, sugar-mills have been constructed with four rollers, which are placed two below, and the other two above, and immediately over the former. These mills have been greatly extolled, producing, as it is said, from 70 to 75 lbs. of juice from 100 lbs. of canes, with a motive power little, if any, greater than that which is required by an ordinary three-roller mill of equal size. I have not seen mills of this construction in operation, but I believe that the advantages, which they are said to possess, have not been exaggerated.

That, by any mechanical means, the whole of the juice will ever be extracted from the cane, cannot be expected; indeed, from obvious physical causes, this result would be impossible; but it is certain, that the quantity at present obtained, 50 lbs., may very readily be increased to 70 or 75 lbs. from 100 lbs. of canes.

It is evident, that in recommending the effective squeezing of the canes, the preservation of the megass has been regarded as a very secondary consideration.

No doubt it would be exceedingly agreeable were we able to extract the entire amount of juice from the canes, and yet find in the remaining 10 per cent. of woody fibre, &c., a sufficiency of fuel to evaporate an equal amount of cane-juice during the ensuing crop. Unfortunately, we cannot have our cake and eat it too. The question to be decided is very simple, namely, whether all our labors have been expended in raising canes for fuel, or for the manufacture of sugar.

The absolute quantity of wood contained in the stem of a sugar-cane is 10 per cent. of its weight. The only other constituent which, when the cane is carefully exsiccated, may likewise serve as fuel, is the sugar, and this may be considered as amounting to seventeen parts per cent. The quantity of water will then be about seventy-two parts in one hundred. These proportions are subject to variations from many causes; but they are sufficiently stable to illustrate what I wish to point out, namely, that the amount of combustible substances contained in the cane is to the water as 27 to 72.

The extent of evaporation that can be effected by the combustion of sugar, has not, I believe, been ascertained in this part of the world; it is only in the colonies that the extensive use of this substance as an article of fuel is ever heard of. Let us, however, suppose that the mixture of sugar and wood, such as exists in a carefully dried cane, equals, in this respect, coal; and that when it is employed in the unskilful and wasteful manner at present practised with the megass, it is capable of evaporating five times its weight of water. It will follow that the fuel obtained from 100 lbs. of dried canes is equal to effect the evaporation of 135 lbs. of water, or in other words, that it will be able to inspissate the whole of the cane-juice contained in 200 lbs. of canes, to the state of a strongly granulated syrup.

Fifty pounds of megass (if carefully dried and preserved with the greatest care) obtained by the expression of an equal weight of juice from 100 lbs. of canes, would, by a similar calculation, contain ten pounds of wood and $\frac{4}{9}$ of 17 lbs. of sugar = to about $17\frac{1}{2}$ lbs. of fuel, capable of evaporating $87\frac{1}{2}$ lbs. of water, or, of reducing to perfect dryness, the whole of the juice contained in 121 lbs. of canes.

Unfortunately, it is found in practice impossible to dry the megass in such a manner as to preserve within it the quantity of combustible materials given above. For whether it be stacked at once, or be previously exposed for some hours to the rays of the sun, fermentation of the juice retained in it commences, and the sugar is converted into incombustible bodies, as gum, lactic acid, &c., or, into others, which are rapidly evolved, as carbonic acid and alcohol; so that when the time arrives when its use as fuel is required, little more remains available for the purpose than the woody fibre; that is to say, that instead of obtaining $17\frac{1}{2}$ of fuel from canes which have given 50 parts in 100 of juice, 10 parts only are actually serviceable; and the amount of evaporation which could be effected by this quantity, would be equal to 50 lbs. of water only.

The planter would appear to be in a great measure aware of this fact, by offering as a reason for the imperfect pressure to which he submits the canes, the fear of having a larger evaporation to effect than his fuel is capable of accomplishing. When he states, however, that by imperfect pressure he is thereby obtaining a proportionately increased supply of fuel for the following year, he is manifestly in error, for the only constituent of the cane on which he can rely for that purpose, is the woody fibre, which will be equally abundant to whatever extent the pressure may have been carried.

To exemplify the loss which a sugar plantation annually sustains from an adherence to this most shamefully extravagant system, I will suppose, that by increased pressure the amount of cane-juice obtained is augmented merely from 50 lbs. to 60 lbs. in every 100 lbs. of canes. It is clear that the amount of sugar, molasses, and rum, must be increased in the same proportion, and, therefore, an estate, which otherwise would give 200 tons as its annual product of sugar, would, from this cause alone, afford 240 tons.

Let us also suppose, that there being no other available fuel at hand in place of the megass, coals have to be imported from England, at an expense of 1*l.* per ton, and that 240 tons would be required to evaporate the requisite quantity of cane-juice to make the same number of tons of sugar; the price of the coals would represent the expense attending the augmentation of the produce. The sugar would be worth at least 20*l.* per ton, consequently, the clear gain would be 800*l.* less 240*l.*, or 560*l.*

The profit, however, would not be confined to the mere increase of forty tons of sugar; the megass, after due fermentation, would produce an amount of farm-yard manure, which, when thrown upon the land, would augment the quantity of canes for the ensuing crop, at least, 20 per cent., and, in the greater number of colonies, very m uch more. In Barbadoes, for instance, there are many estates that

after a good supply of manure, readily yield, in favorable seasons, three tons of sugar per acre, which, without that assistance, would not yield one.

But, admitting that a planter may not choose to employ his megass in that manner, it is still available for the purpose of fuel, for its woody tissues remain in all their integrity; and, probably, by its employment, the quantity of coals required would be reduced to less than half the quantity given above.

I cannot, however, leave this subject without again entreating every proprietor of sugar estates in the West Indies, to give it his most serious consideration. If, as I believe, the average quantity of juice expressed from the canes in those colonies does not exceed 50 per cent., and, if by a moderate share of attention, it may be increased to 70 per cent. by means already possessed by the great majority of estates, it is evident that the augmentation of the produce that would follow the adoption of a careful and economical system of expression, would be equal to 40 per cent., and that the only additional outlay which would accompany it would be the cost of the material employed for fuel. If we take 30 tons as the weight of plant canes grown on one acre of land, and if we suppose, that by a judicious pressure, 70 per cent. of juice has been obtained from them = 21 tons, we shall possess nine tons of megass available as a manure. We will also admit, that three tons of coals would be required to concentrate this quantity of cane-juice to a crystallizable syrup, and that their cost would be 3*l*. This must be placed against the nine tons of manure, the value of which would be, at least, 4*l*. 10*s*., or 10*s*. per ton; consequently, the value of the megass, employed as manure, would be 50 per cent. greater than it is when used as a material for fuel; and the increased saving to the estate would observe the same proportion.

MOTIVE POWERS APPLIED TO SUGAR-MILLS.

The motive powers attached to the sugar-mills in all the colonies, consist of cattle, wind, water and steam. Whatever be the power, it is essential that it should be sufficient for the purposes which it has to perform; and that it should be at all times available. When these requisites have been obtained, we may then study, what is generally so much talked about in the colonies, economy, a term, however, which is often most egregiously misunderstood.

Cattle-mills are still very generally seen in many of the colonies. The animals usually employed are mules. From their great cost, from the number required to perform the work, from the mortality to which they are subject, and from the additional labor which their care, food, &c., entails, this kind of power is very expensive. The only advantage that I have ever heard attributed to it, is the manure which its employment furnishes. Manure must, indeed, be much wanted, and its value must be great under such circumstances; for the droppings of animals so lean and ill fed, as those poor creatures too often are, are almost worthless for such a purpose, being scarcely better than the herbs that they have fed upon.

Wind is frequently employed as a motive power, and, in Barbadoes, it may be said to be almost the only one. It offers, at least at first sight, economy as a recommendation, which, without doubt, is a very considerable one. The trade-wind, which sweeps across the tropical portions of the Atlantic Ocean, particularly during the period of the year when the sugar crop is going forward, constitutes a force sufficiently powerful for the ordinary wants of the mill. But even there it does not altogether lose the character of fickleness so commonly attributed to winds in general; so that it not unfrequently happens, that the crop is retarded until the juice of the canes has much deteriorated, by the setting in of the rains, probably at a period unusually early, from the want of a sufficient amount of motive power. I think, that where this power is used, it ought always to be accompanied by a small high-pressure steam-engine, as an auxiliary when circumstances may require it.

Water, where it is sufficiently abundant, and where the supply can be always depended upon, is, unquestionably, the power best suited to the circumstances in which the West Indies are placed. It is as economical as wind, it is more powerful as generally applied; it is very manageable, and its force is easily regulated; and, at the same time, it is unaccompanied with the same uncertainty. Unfortunately, few estates are so situated as to admit of the application of this power.

Steam is a power that is universally applicable, and its employment, consequently, is becoming daily more general. Its advantages are indisputable; but it would be impossible to discuss in this place a subject so extensive. The steam-engine best suited for the purpose we are inquiring into, is that which is denominated the *high-pressure engine*. As at present constructed, this kind of engine may be used without fear of accident. Its cost is small; it is easily managed and kept in repair, and its economy, both in fuel and water, is considerable.

The juice having been expressed from the canes, its defecation, or, as it is usually called, clarification, ought immediately to be proceeded with.

In many colonies this operation is dispensed with. When it is performed, the process is as follows:—

For the most part the cane-juice, as it comes from the mill, is received into a cistern capable of holding 500 or 600 gallons or more, in which it is permitted to remain until the clarifiers, or one of them, is ready to admit it. These cisterns, or cold receivers, as they are called, are made of copper occasionally, but, generally, they are merely wooden boxes, lined with sheet lead. The use is very properly becoming less frequent daily.

Where the cold receiver is not in use, the cane-juice passes from the mill directly into one of the clarifiers, which are shallow copper pans of a circular form, almost flat, or rather arched slightly upwards at bottom, and capable of holding from 250 to 500 gallons each. Each is hung over a separate fireplace, which is supplied with a

damper to regulate the combustion of the fuel, or for checking it altogether when required.

When the clarifier is nearly filled, heat is applied, and on the cane-juice attaining a temperature which varies according to the fancy of the person who has charge of the operation, but which is usually about 140°, a portion of lime is added, either in its caustic state, or in that of a hydrate, or, as it is called, *slaked*. Usually the lime is slaked by means of water, and it is then made to form a milky or creamy-looking fluid; but occasionally this effect is produced by the addition of clarified cane-juice, or of syrup taken from one of the coppers. The latter plan has its admirers; for the lime, when thus treated, having entered into combination with a due proportion of sugar, its combination with the sugar of the cane-juice, it is thought, is less likely to take place.

In which way soever employed, the quantity requisite to perform the desired effect is a point on which few sugar-boilers agree; they all admit, however, that it varies according to the quality of the cane-juice.

To ascertain with greater accuracy the amount of lime required, it is customary in many boiling-houses to fill three or four wine-glasses with cane-juice drawn from the clarifiers, and to drop into each successively increased quantities of lime-water; the one which produces the most favorable result being taken as the indication of the quantity demanded.

On the addition of the lime, the cane-juice is freely stirred, so that the two bodies may be intimately blended together. The heat is cautiously increased until it approaches the boiling point, and until a thick scum forms upon the surface, which cracks and separates into two or three pieces, allowing the clear liquor to be seen between them.

The fire is then extinguished, and the cane-juice is suffered to remain undisturbed until the remaining feculencies have subsided. When this is supposed to have taken place, the cock of the clarifier is turned, and the clarified juice passes immediately into the grand copper.

Cane-juice defecated in this manner is generally transparent—of a yellow color, occasionally approaching to orange; it may be alkaline or neutral, or slightly acid, according to circumstances. On attentive examination, minute flocculent particles may always be discovered in it, either by the naked eye, or with the assistance of a common lens.

One or two planters of my acquaintance are in the habit of submitting the cane-juice to a double clarification; the first by means of heat alone, the second with heat and lime combined.

The above is the plan usually pursued in performing one of the most important operations in the whole process of sugar-making; although in many respects the object to be attained by it is but imperfectly accomplished, nevertheless, very considerable benefit is at all times derived from it.

By defecation, our purpose is to remove as much as possible from

the cane-juice all those substances which are likely to injure the quality of the sugar by their mechanical mixture with it; or those, the presence of which would, if long continued, inevitably produce some chemical change in its saccharine principle, and thereby either diminish the quantity of sugar which ought to be obtained, injure its quality, or produce both these results.

Those substances are, as before stated:—1st. Insoluble impurities, consisting of small particles of earthy matter, bruised pieces of cane, chlorophylle, &c. 2d. The proteine compounds, albumen and caseine. 3d. Soluble coloring matter. 4th. Salts. We possess no means of getting rid of the last mentioned, as I have before had occasion to state.

The separation of the first, or insoluble impurities, can be effected by means purely mechanical. In the West Indies these matters are permitted to run into the clarifiers, as we know, and are separated only subsequently to the application of heat. But this plan always entails a loss of cane-juice, which is retained in a considerable quantity in the bulky scum at the top and the thick sediment at the bottom. This loss may be prevented, and a better defecation obtained, by submitting the cane-juice to a coarse straining, rather than a filtration, previously to its going into the clarifier.

Filtration of the cane-juice, antecedent to its passage into the clarifier, has been repeatedly practised, and discontinued, in consequence of its either being too tedious an operation, or from the difficulties which have attended it. The object of filtration at this early stage, it should be remembered, is merely to separate the coarser insoluble particles suspended in the cane-juice. It must be performed so rapidly that the means employed shall offer no impediment to the free transmission of the passage of the liquid, or add to the risk of decomposition ensuing. For this purpose a large double-bottomed sieve should be suspended over each clarifier, the meshes of which should be formed of metal wire $\frac{1}{12}$ of an inch apart in the upper one, and $\frac{1}{30}$ of an inch in the one below. When the sieve is foul, after each filtration, the upper bottom must be removed, and the adhering impurities washed out.

The removal of the proteine compounds, albumen and caseine, and the soluble coloring matter, cannot be effected so easily; for this purpose we must call in the assistance of chemistry. The only chemical agents at present employed are heat and lime.

The first coagulates, and renders insoluble the vegetable albumen which at the same time envelopes and entangles a large quantity of the flocculent particles suspended in the liquid, and thus assists considerably their separation, in the same way as the white of an egg, or the serum of the blood, when added to liquids that it is wished to clarify. Heat, alone, however, is insufficient to produce those effects upon cane-juice which are understood by the term defecation. Syrups obtained from cane-juice thus treated would show little disposition to granulate, while they would have a strong tendency to decompose. Experience has shown this to be the case; therefore, from time immemorial, the application of heat has been assisted by

the addition of lime, or an alkali obtained by the incineration of some favorite vegetables. Both soda and potash, either in their caustic states, or as carbonates, defecate cane-juice equally as well as lime; but the great injury that their presence would inflict upon the sugar and molasses, renders them inadmissible for this purpose.

The action produced by caustic or recently slaked lime on cane-juice, is a very complex one; and I believe we are at present far from thoroughly comprehending it. It merits attentive consideration.

When a drop or two of the milk of lime be suffered to fall into a tumbler of cane-juice, the color of the latter is immediately changed from a greyish green to a bright yellow, on the spot where the lime has fallen. This change of color is accompanied by the separation of the liquid into two parts, the one being a solid heavy precipitate, formed by the collecting together of the insoluble impurities; the other, being the cane-juice rendered tolerably clear by the separation of those substances.

Lime saturates any free acid it may meet with in the cane-juice; it sets free a small quantity of potash; it forms an insoluble compound with a portion of the caseine, which is either precipitated, or which rises to the surface in the scum; it combines with three times its weight of sugar—the substance produced being very sparingly soluble in cold, and still less so in hot water; it deepens the color of the juice.

When the cane-juice contains a small quantity of lactic and acetic acids, an event which occurs more frequently now than formerly, owing to the want of a sufficiency of labor to hasten the stages of the manufacture, the lime combines with those acids, and forms uncrystallizable salts, which preserve a portion of the sugar with which they may be in contact in a fluid state.

Should a small quantity of glucose be present in the syrup, which is always the case when concentration has been conducted as it now is in the colonies, the lime, probably assisted by a small quantity of potash which has been set free, speedily converts it into glucic acid; and the glucates, when formed by the prolonged action of the heat, are as quickly converted into melasinates of the same bases, and the whole syrup is thus rendered of a dark brown or black color.

Cane-juice, defecated as judiciously as possible by means of lime and the application of heat, throws down a further precipitate on the addition of a little diacetate of lead.

It might be supposed, that as lime and heat alone are insufficient to produce the entire separation of all injurious substances from the cane-juice, and, as the employment of the former is far from being entirely innocuous, that its use ought to be dispensed with, and that some other substance ought to be substituted for it.

We have seen, that many substances are capable of throwing down caseine from its solution in cane-juice, more or less completely; but the action of some of them is less complete than that of lime; and others are inadmissible, either in consequence of the ulterior injurious effects which would be produced on the sugar, or from their poisonous qualities. We are therefore compelled to con-

tinue the employment of lime, either alone, or, still better, associated with other substances which promote its powers; and, consequently, enable us to use it in quantities so small, as to remedy many of the evils which result from it as at present administered.

1. *Defecation by means of lime, and subsequent filtration.* The first thing to be attended to, is the quality and method of preparing the lime. This substance ought to be as pure and free from admixture with silicious or other foreign bodies as possible. It should be carefully burnt, and immediately slaked with boiling water, which should be added in such a quantity as to form a mixture of the consistence of cream, and the whole should be strained through a fine wire sieve.

The cane-juice, previously strained as before recommended, having been received into the clarifier, heat is to be applied to it as quickly as possible. In the meantime, its acid reaction should be tested by means of litmus paper, so that we may form an idea of the quantity of lime which will be required. Usually, the acid reaction is slight, but decided; that is, the litmus paper is changed by it from a blue to a reddish purple or purplish red; but cane-juice presents great variations in this respect, and with the amount of variation will depend that of the lime to be added.

The temperature of the liquor in the clarifier having risen to about 130°, a measure of the milk of lime, containing from four to six ounces of pure burnt lime, is to be added, and the whole intimately blended together by means of an oar for a minute. The liquor must be again tested, and, if necessary, an additional quantity of lime must be given to it, until it presents a perfectly neutral reaction; that is, until it neither changes the blue color of the paper to a red, nor that into blue, which has been previously made red by the vapor of vinegar. The heat is to be continued until perfect ebullition has been established for two or three minutes. The cock of the clarifier is then to be turned, and the liquor passed directly into the filters.

Each clarifier is supposed to contain 300 gallons. The filters which may be employed, are either the common bag filters or the charcoal filters, both of which will be explained presently. The latter, however, is an operation uncalled for in this stage of the manufacture of sugar from the sugar-cane, if the defecation has been carefully attended to.

From the filters the liquor should pass directly into the coppers, whenever this can be accomplished. Unfortunately, as the generality of boiling-houses are arranged, this is rarely practicable, in which case it must run into a cistern constructed for the purpose, and be pumped from thence into the pans.

When carefully performed, and the quantity of lime accurately given, this method is a very good one, and answers very well if the cane-juice be good, healthy, and freshly expressed.

When the quantity of lime has not been quite sufficient, so that the liquor has a slightly acid reaction, the color of the sugar will be light, but the grain small; on the other hand, if the liquor be slightly

alkaline, the grain of the sugar will, *cæteris paribus*, be bolder, firmer, and larger, but the color will be darker.

Whatever be the kind of vessel employed to perform the above, or any of the succeeding modes of defecation, it is essential that it shall be constructed of copper. The ordinary clarifying pans of the West Indies are all formed of this metal; but some of those which have been latterly introduced, and which have been constructed on the same principles as the blowing up cisterns used by refiners, have been made of, or lined internally, with iron; and I need not say, that they are, in consequence, unfitted for the performance of many of the most successful methods of defecation about to be described.

2d. *Defecation by nutgalls.* To two ounces of nutgalls, finely bruised, add half a gallon of boiling water; infuse for twelve hours, and strain; neutralize, by means of cream of lime, a clarifier of cane-juice containing 400 gallons, and when the temperature is about 150° to 160°, add the infusion of galls; mingle the whole together by means of a ladle or an oar, boil for three or four minutes, and filter through bag filters.

This method may be followed with advantage when the cane-juice is viscid, without increased acidity.

3d. *Defecation with sulphate of zinc.* To a clarifier containing 300 gallons of cane-juice, previously deprived of its insoluble impurities by straining, add, as soon as possible, twelve ounces of sulphate of zinc; apply heat, and when the temperature has risen to 150°, add as much milk of lime as will render the liquid neutral, or, in the slightest degree, alkaline; boil for two or three minutes, and filter through bag filters.

There are few substances which defecate better than sulphate of zinc, employed in this manner. But it must be remembered, that this substance is poisonous, and, whenever used, it is absolutely necessary to filter the liquor through bag filters, which retain the sulphate of lime and insoluble oxide of zinc, in combination with the organic matters that have been acted upon; while the defecated liquor passes through free from any deleterious admixture.

4th. *Defecation by means of alum.* Dissolve four pounds of common alum in a sufficient quantity of pure water, and when the cane-juice in the clarifier (350 gallons) is just beginning to get warm, pour it in and mix well with an oar or ladle. The cane-juice will now have a strong acid reaction, and the heat must be quickened, as much as possible, to 140°, so that neutralization may be effected by the addition of milk of lime, added in repeated doses, until the litmus paper is no longer altered. Boil and filter as before.

Common alum is a combination of sulphuric acid, alumina, and potash. In the above operation, the lime has set free the alumina, which immediately combines with the coloring matter; and the free lime and sulphate of lime, produced by the decomposition which has taken place, precipitate almost entirely the other organic substances of the cane-juice, leaving the sugar unaltered. We could, therefore, desire no better means of accomplishing our object, were it not that the sulphate of potash is retained in solution in the cane-

juice, and its operation on the syrup and sugar, ultimately obtained, would be injurious.

5. Defecation by means of the sulphate of alumina. This substance is employed in the way just described for alum. It does not contain potash, but is composed of alumina and sulphuric acid only. The proportions required are about one pound to every 100 gallons of juice; but twice, or even thrice that quantity, may be given with advantage. We must be careful, however, to neutralize the liquor, thus treated, as quickly as possible with milk of lime, otherwise some risk would be incurred of converting a portion of the sugar into glucose. Every pound of the sulphate of alumina will require about seven or eight ounces of caustic lime to effect its decomposition; but a slightly additional quantity may be given in all cases, beyond what is merely necessary, although the liquor may thereby be rendered slightly alkaline.

I can conceive no better method of defecating cane-juice than this. The liquor as it comes from the filter is almost colorless; and all the after processes to which it is submitted are extremely satisfactory. I have produced sugar from cane-juice thus acted upon, equal in color to the finest clayed Havannah, and possessing a sharp and sparkling grain.

Unluckily, the sulphate of alumina is not an article of commerce in this country, owing to there being no demand in it. It can, however, be obtained from France, where it is used in the manufacture of beet-root sugar. We possess by the decomposition produced, three defecating substances of considerable power; namely, the alumina, the sulphate of lime, and the free lime which has been added in excess.

The application of this plan is attended with little expense, and no trouble; and the results obtained are, as I have just stated, such as to recommend it for general adoption.

6. *Defecation with the sulphates of alumina and zinc.* A combination of these two substances may *occasionally* be employed, I think, with some benefit. A few experiments induce me to advise a trial of the plan, if merely to ascertain in what respect the results obtained differ from those of the last. The proportions used by me have been, one pound of the sulphate of alumina, and two ounces of the sulphate of zinc, to 100 gallons of juice. The way of proceeding is exactly as above, and the lime must be added as indicated by litmus paper.

7. *Defecation by means of alumina and sulphate of lime.* This method is one which has been pursued with some advantage by refiners, both in this country and in France. Two pounds of common alum are to be dissolved in about two gallons of water, either in a wooden or earthenware vessel; purified chalk, which is a carbonate of lime, is slowly to be added, and the two intimately mixed together. When all effervescence is over, and does not recommence on the addition of a little more chalk, the decomposition is complete. The mixture is allowed to stand until the alumina and sulphate of lime have subsided. The supernatant water holding the sulphate of potash

in solution, is poured off, and other water added; and this must be repeated until all taste of the sulphate of potash has disappeared. The mixture is then to be thrown into the clarifier, and intimately mixed with the cane-juice when lukewarm; the above quantity being added to every 100 gallons. Lime must be used to neutralize the cane-juice when the temperature has reached 150°. The whole must be boiled for a few minutes and filtered as before.

8. *Defecation by sulphuric acid.* About two fluid ounces of sulphuric acid, diluted in thirty times its bulk of water, is thrown into 300 gallons of cane-juice, at a temperature of 120°, and the whole well stirred together. In about three or four minutes, four ounces of lime, prepared as directed, are to be added, and the stirring continued until the temperature reaches 170°. More lime is then to be added until the liquid is perfectly neutral. It must boil for a few moments, then be filtered.

At the first sight this would appear to be a most unskilful and injurious way of treating cane-juice. The action of the sulphuric acid, if long continued, would convert the whole of the sugar into glucose; and it is not improbable that this effect is produced to a very small extent, even in the short time that the two are in contact. The injury, however, is less than, under the circumstances, might be supposed.

But it is not on healthy cane-juice that this method of defecation should be employed; for the results obtained by the others are, in such cases, very much superior, whilst they are unaccompanied by any mischievous consequences. There are, however, certain states, in which cane-juice is occasionally found eminently benefited by this mode of treatment.

Almost all viscid cane-juice is so, but that which is obtained from one of the conditions of the cane, described, usually, as being "burnt," is the one to which it is most applicable.

9. *Defecation by diacetate of lead.* When seven parts of finely powdered litharge, six parts of sugar of lead, and thirty parts of water, are digested together at a moderate temperature, the liquid which is found at the top consists of this salt in solution in the water. It constitutes the *liquor plumbi subacetatis* of the pharmacopœia, and is often considered as a tribasic salt.

If to 300 gallons of cane-juice, accurately neutralized with lime or chalk, five ounces by weight of this liquid, diluted in a quart of distilled water, be added, and the whole be carefully stirred and heated, the most complete separation of all the organic matters, sugar alone excepted, is immediately effected.

A patent was taken out a few years ago by some parties in this country, for defecating cane-juice and other saccharine liquids by this means. It was therein proposed to precipitate any excess of the diacetate of lead which might remain in solution with the biphosphate of lime.

This process requires a double clarification; the acetate of lead should be added in one vessel, then the cane-juice, having been deprived of all the insoluble coagula which had resulted from the

action of this substance, must be passed into a second; and therein, when mixed with a certain quantity of the biphosphate of lime, it must be boiled for a few minutes, and again filtered.

On the addition of the biphosphate of lime, it is presumed that the soluble diacetate of lead will be converted into the insoluble phosphate of lead, and that the acetic acid will form, with the lime, an acetate of lime.

That this double decomposition would take place under ordinary circumstances, must be admitted; but that it will *always* do so, at least, perfectly, when sugar is present in the solution, may be doubted.

I have defecated cane-juice repeatedly with the diacetate of lead, employing, however, generally the sulphate of alumina as the decomposing agent. In every instance the test of sulphuretted hydrogen was applied to the filtered liquor; and it not unfrequently happened, that, in spite of all the care bestowed, a quantity of lead was detected in it.

For this reason, from the additional time and labor required for the double clarification, and from the amount of acetic acid set free, which, whether in that state or when combined with a base, would prove injurious to the sugar, I conceive that this process would be inapplicable to the manufacture of sugar in the colonies.

Indeed, it has been used there, and the consequences which ensued to a great number of persons who made use of the sugar, are now a matter of history. The effects produced in the case alluded to, were, no doubt, much more severe than they would have been, had the cane-juice or syrup been properly treated; so that a portion of the lead having been rendered insoluble, had been separated by means of filtration. The fact of their having been produced, however, indicates the impropriety of admitting the employment of the salts of lead in any of the processes, either of the manufacture or the refining of sugar. Its presence is easily detected; and, if no other evil consequence ensued, its discovery would cause all sugars, imported from the estate where it had been employed, to be regarded with suspicion, if not altogether unsaleable, for a long time afterwards.

10. The bark of the wild elm, *theobroma guazuma*, has been used in Martinique and Guadaloupe for defecating, or rather for clarifying cane-juice, with considerable success it is said. I have never seen this substance employed, and therefore am ignorant of its value as a *defecating* agent.

I have now mentioned all the methods of defecation, which I think may be employed with advantage in a colonial boiling-house. I have endeavored to point out the importance of this operation, and to show, that upon its being well or badly performed depends much of the success of all the subsequent processes.

That defecation may be effectual, a temperature sufficient to produce the ebullition of the cane-juice is necessary. As at present performed, the cane-juice is not allowed to boil; otherwise the separation of the flocculent coagula and other solid matters from the liquor in which they are suspended, would be impracticable. The

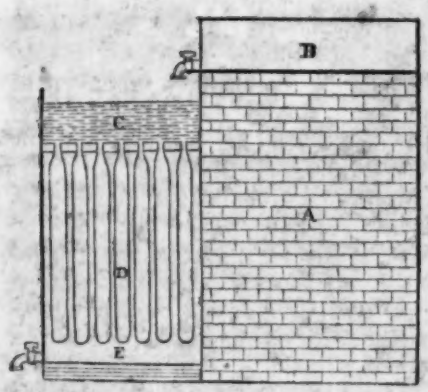
heat is raised to that point, merely, which is necessary to produce the cracking of the cane-juice; and this degree effects a partial separation only of the substances which are coagulated by heat.

Should the temperature exceed the above point, ebullition would ensue, and filtration is then required to separate the coagula. The advantages which filtration at this stage of the manufacture present may be stated as follows:—1st. The greater facility of managing the operation, as the cane-juice being allowed to boil, the attention at present required to the due regulation of the temperature may be dispensed with. 2d. Ebullition is essential to the complete coagulation of the albumen. 3d. Economy of time, as, after two or three minutes of smart boiling, the liquor is allowed to run into the filters at once. 4th. An increase in the quantity of liquor, as nearly the whole passes through the filters, the solid matters alone being retained. 5th. The complete separation of all solid matter, and the greater transparency of the defecated juice.

The necessity for the filtration of the cane-juice being performed, either at an early or later stage of the manufacture, is so obvious and so universally admitted; and as it is an operation which can be performed in every boiling-house, as at present constructed, during some part of the process of sugar-making, it is surprising that it has not been universally adopted.

The filters in use in Europe to separate the mechanical impurities from syrups, are known by the name of bag filters: they consist of a number of strong calico bags, about eighteen inches wide, and from three to five feet in length, each of which is introduced into another bag of the same length, but only six inches wide, and made of a strong and open canvass. Into the neck of each sack thus arranged, is inserted a short metal tube, to which the sack is tied, and by which it is fixed to the bottom of a cistern adapted to receive the cane-juice as it comes from the clarifier. This vessel is placed over the case in which the filters are contained.

It is obvious, by such an arrangement, a large amount of filtering surface is obtained in a very small space. We are, therefore, supplied with a means of most perfect, and, at the same time, most rapid filtration. This apparatus can very easily be made in every colony. The case may be very conveniently constructed of wood, and at the bottom should be attached a cock, which either allows the liquor to escape into the coppers, when practicable, or, when that is not the case, into a receiver constructed for the purpose. The apparatus should be placed under the cock of the clarifier, and, of course, the number of them must be equal to that of the clarifiers. Each should contain a set of twenty bags; and another set should be provided for use when the first are being cleaned. The accompanying sketch will enable us to form an idea of the construction of a set of bag filters, and their mode of application.



A. Wall of clarifier.
B Clarifier, with cock.
C. Upper cistern of filters.
D. Filters enclosed in their case.
E. Lower cistern and discharging cock.

If the double sieve, formerly described, is not employed for straining the cane-juice previously to its admission into the clarifier, it ought now to be used and placed between the cock of the clarifier and the lower part of the upper cistern of the filters; otherwise the bags would be speedily choked, and the operation would consequently be retarded.

A very few dollars would be required to form the necessary number of filters if expended in the colony. If preferred, they may be obtained from any of the coppersmiths in the large towns of England and Scotland.

In the manufacture of beet-root sugar, the defecated juice, instead of passing through bag filters, is made to percolate through beds of animal charcoal, which has already been nearly exhausted by the filtration of inspissated syrup. On an estate where animal charcoal is used for the filtration of the syrups, it may be advisable to wash out the adhering syrup with cane-juice instead of water, as it may be considered more economical. I doubt, however, whether this would be a very practicable operation on a large estate, and when time is so much an object.*

The foregoing remarks are applicable to the clarifying vessels now in use in the colonies. These vessels, perhaps, might be made a little deeper with advantage.

Steam defecating vessels have been lately constructed. They consist of an iron chest lined with copper, in which is coiled a hollow pipe, made of the latter metal, having an area and length sufficient to supply the due amount of high pressure steam to effect a rapid ebullition of the cane-juice.

Were steam the heating medium in use in the other stages of the manufacture, no doubt it would be equally applicable to the one before us. But to use it in this part of the process where it is not required, and not in the others, would be a piece of folly, which, I trust, it is not necessary to point out.

* Perfectly practicable; used on two estates in Louisiana; on plantations greatly preferable to the bag filters, which are very troublesome.—[*Note by a friend.*

Art. III.—INDUSTRY OF THE SOUTHERN AND WESTERN STATES.

VIRGINIA— NORTH-CAROLINA—SOUTH-CAROLINA—GEORGIA— FLORIDA —ALABAMA— LOUISIANA—MISSISSIPPI—TENNESSEE—KENTUCKY— OHIO—MISSOURI—MICHIGAN—ILLINOIS—INDIANA—IOWA—WISCONSIN.

The Secretary of the Treasury, it will be remembered, in 1845, issued a circular to all the manufacturing, commercial and agricultural interests of the different states of the Union, and appended to his report of that year the various answers which had been received in his office. These answers being partial and very incomplete, were not digested, but published *in extenso*. The manufacturers, for a large part, did not answer at all; and from many of the states, there came but the most meagre returns.

As, however, among these papers thus published by the treasury, there are many of considerable value, embodying a vast amount of practical information, we have thought some service might be done by an analysis of them, especially of those relating to the Southern and Western States, which are in general most complete.

From many interesting points there are no returns, and often where they are given, many discordances exist in different statements. The parties often appear to have a case to make out, and we are sometimes inclined to suspect the influence of politics. Nevertheless, as we give both sides a hearing, no mischief can accrue.

Nothing more than such a state of things should urge upon the states the importance of establishing Bureaus of Statistics, in connection with their governments, as was lately done in Louisiana. The expense would be a mere trifle in any case; the advantages inappreciable. Mr. Burke, in his last Patent Report, says: "I have been informed, that a bill has been introduced in the legislature of Louisiana, providing for the establishment of a *Bureau of Statistics*. It is ardently hoped the example will be speedily followed by the other states of the Union."

It will be observed, that these returns were made several years ago, and that agriculture, commerce and manufactures have increased vastly in all the sections since then. In regard to most of the states, the reader will find in the volumes of our Commercial Review, published in 1846, '47, '48, the very latest, most complete, and reliable particulars to which we refer. We may hereafter digest the returns to the circular from the Northern and Eastern States.

1. Commencing with Virginia, the returns from it are utterly unimportant. Mr. Points, of Staunton, enumerates horses, cattle, mules, sheep, swine, poultry, wheat, barley, oats, rye, buckwheat, corn, wool, hops, wax, potatoes, hay, flax, hemp and tobacco, among the agricultural products. Flour and tobacco principal exports. Manufacture of iron increased 10 per cent. since 1842.

2. From North Carolina there are three returns. Mr. Jones, collector, at Wilmington, states there are in Cumberland county six cotton factories, water power: three joint-stock, established prior to 1840: largest capital, $140,000; others average $40,000; annual profits about 14 per cent.; lumber and turpentine business equally as profitable. Factories work ten hours a day; much of their products sent to northern markets. Of these products of North Carolina, a small portion is exported to British North America, but no shipments are made direct from North Carolina to foreign ports. The western portion of the state is supplied with domestic iron, and the factories are remote from navigation, and from the points of importation. Mr. Singleton, of Newbern, states, North Carolina produces cotton, rice, tobacco, corn, wheat and oats; exports boards, planks, scantling, square timber, masts and spars, staves, shingles, heading, hoops, tar, pitch, rosin, turpentine and spirits of turpentine; chief exports, wheat and corn. Mr. Pritchard, of Elizabeth city, estimates nineteen-twentieths of the capital of North Carolina employed in agriculture; average profits on agriculture, last three years, had not exceeded 2 per cent., partly from a failure of crops. Agricultural prosperity of state greatest from 1832 to 1841, capital paying from 5 to 8 per cent.

"The state produces a sufficiency and an excess, except horses and mules, which are brought here in limited number, from Ohio, Indiana, Tennessee, Kentucky and Western Virginia. The prices have been 33 per cent. lower the last three years than the ten preceding. The decline I attribute to the reduced means of purchasing, in consequence of the low price of wheat and corn. We export tar, turpentine, lumber, salted fish, &c.; it is difficult to say whether they have been affected by the tariff of 1842. We export but little direct, owing to the peculiar situation of our state and its bad outlets to the ocean—most of our produce finding its way to New-York, (through the ports of Virginia,) and to South Carolina and Georgia. Some lumber, corn and beans, go directly to the West Indies. The prices are regulated by the foreign demand. We have 25 or 30 manufacturing establishments (mostly cotton) in the state. They are said to be doing well. Ship-building was once followed to a great extent, but at present, there is not enough tonnage to do the coasting trade, having to rely on canal boats of Norfolk and the New-England vessels. The capital employed in commerce is about as one to two of the agricultural products and staples for sale and export."

3. South Carolina.—P. W. Fraser: "Products—wheat, corn, rice, cotton, tobacco, potatoes, sugar, hay, hops, silk, wine, &c. Rice, cotton, corn, wheat and potatoes, are the principal staples of South Carolina. In 1840, 60,590,861 lbs. of rice were produced; 61,710,274 lbs. cotton; 14,722,805 bushels corn; 968,354 bushels wheat, and 2,698,313 bushels of potatoes. The price of rice has been very low for several years, until the present time; and my estimated average profit on capital for the last three years 6 per cent.,

after deducting all expenses. I confine my answer to this one particular. The price of rice from the year 1832 to 1844, has varied almost every year from 60 cents per bushel, rough rice, to $1; clean rice, $2 40 to $4 per 100 lbs. I estimate my average price of rice at about 70 cents per bushel rough rice, or $2 80 per 100 lbs. clean rice, in consequence of rice selling oftener at the lower than higher point of the market. Indeed, it has seldom happened, that rice sold in the Charleston market at $4 per 100 clean rice, or $1 per bushel rough rice. The annual average income per hand or laborer, deducting all expenses, can easily be estimated by the hire; by which standard I am disposed to be governed; and I consider full task hands must have brought annually, during those years, $60 per head, and the furnishing $15, leaving $45; many planters realize $100, or more, depending upon locations, etc. The state of South Carolina is not dependant on any state, and raises largely of every kind; but many horses and mules are brought into the state and sold, from Kentucky, Tennessee, &c. Number of horses in 1840, 129,921; but cannot give the average annual amount or price for the years specified. Aggregate amount of wool in 1840, was 299,170 lbs. Previous to and after I cannot say; prices generally prevailing from 25 to 50 cents per lb. In 1840, iron, 2,415 lbs.; salt, 2,250. Gold, granite, marble and other stones, are found in this state, but cannot say what quantity or price for the years specified."

R. F. W. Allston, of Waccamaw Beach, answers elaborately the circular of the Treasury. "Cotton and rice are the agricultural staples of South Carolina. The following statements will be understood as relating to the latter staple exclusively, unless cotton be expressly named. In the business of cultivating and preparing rice for market, a capital of $18,000,000 is employed. Average per cent. profit since 1842, 7⅓; from 1832 to 1842, 8 per cent. For pork and bacon, in the year 1841, and prior, I expended $200 per annum, where I now do not lay out $40, notwithstanding the quantity consumed on the plantation, 10,000 lbs., has been increased to this extent. Boards, scantling, shingles, staves, tar, &c., are also exported from South Carolina.

"Fifteen-sixteenths of the rice crops is consumed by foreigners, and five-sixths of the cotton; exports, cotton, principally to Britain and France; one-eighth goes to north of Europe, Mediterranean, &c. The exports of rice are principally to the north of Europe, Great Britain and Cuba. To Great Britain it is exported chiefly in the rough or crude state, called *paddy*; some shipments are made to France, clean and in the rough, the choicest samples being selected. About one-fourth of the crop is shipped coastwise, principally to New-York and Boston, whence, for the most part, it finds its way to the north of Europe and the West Indies. In Cuba the consumption of Carolina rice is about 17,000 barrels, (average 600 lbs.) Competition is met with here in rice grown in Old Spain, in Maranham and Campeachy.

"In England and the north of Europe, the competition encountered

is great, being from the Java and East India rice, which can be afforded much lower than ours. In England there are mills (constructed by Mr. Lucas, of this state) which will prepare over 300,000 bushels. Whenever it becomes the interest of their capitalists not to purchase our rough rice, the East India paddy is put under the pestle, and thus thrown into the European markets, in a better condition far than they can possibly put it in India or Java. There are several cotton factories in the state operating on a small scale: in Pendleton, in Greenville, (one here of paper also,) in Spartanburg, (one here of iron also,) in Darlington, one owned by Col. J. W. Williams, in which he employs from 40 to 50 operatives. There was one in Marlborough with superior water-power, but I believe it has been abandoned or converted to some other use. In Barnwell, the 'Vancluse' is very successful; in Lexington, near Columbia, the 'Saluda' company divided 5 per cent. the last half year. Limited as is the number of these factories, it is believed they are not dependent for their profits on the present duties; but it cannot be doubted that a number of them were brought into existence by the patronising countenance of government, and stimulated by the temptation to share a portion of the immense profits derived from their peculiar *tariff protection* by the similar establishments at 'Lowell,' Fall River, Paterson, and elsewhere.

"Many of our cotton-planters have already set about manufacturing at home their woollen and cotton goods. I have received, as a present, some of the goods thus made, now and heretofore; they will wear almost as long again as the goods, for the same purpose, coming from the protected factories of the north.

"The average annual imports for ten years, from 1833 to 1842, were $2,089,463; average annual exports for the same time, $10,291,735. The average annual imports for two years, 1843 and 1844, were $1,213,112; average annual exports, same time, $7,597,045. In the year 1800 the produce of the state was exported from her own ports, at which were also received the return cargoes which paid for it. Then trade was brisk; all the interests of the state flourished in a high degree. Then the imports at the port of Charleston yielded a revenue of $2,203,812, (less expense of collecting.) Now, (1843,) the duties collected at the same port are $158,405, gross. The great portion of our import business is done in the northern ports, where the chief revenue is collected on them. South Carolina produces, for exportation, as much rice now as then; but the profits of the commerce based upon her great staples enure to other ports than her own. One-fourth of the rice crop is shipped coastwise, to be exported chiefly to Europe and elsewhere from northern ports.

"Wool is raised in sufficient abundance by many planters. I have no means by which to ascertain the aggregate quantity. I have never known it held at more than 25 cents per pound. It is chiefly paid for in barter; planters having a surplus being in the habit of supplying their more needy neighbors in the country, at a very low rate, with enough, when mixed with cotton, for their annual (home-made) stock of winter clothing.

Edmund Webb, of Anderson Court House, states: "the profits on well-cultivated farms in the upper part of the state, $3\frac{1}{2}$ per cent. on the capital; in the lower part, 5 per cent. State does not raise supply of horses, mules and hogs, by perhaps one-tenth of former, and one-fourth of two latter; introduces them from Tennessee and Kentucky; average price of horses, 1842, '45, $65, mules, $50; pork $2\frac{1}{2}$ *a* 3 cts. gross—a reduction on previous averages.

"We have no mines in the state worth mentioning, except a few gold mines, hardly worth working. We have a few cotton and iron factories in the state—twelve or fifteen of the first, and five or six of the latter. The cotton factories make yarn mostly, and weave some coarse cloths; the iron factories make bar and sheet iron, nails, castings, &c.; cannot state their capital; they are, however, on small scales; their profits are less for the last three years than they were the ten preceding I should say, as they sell their articles from 50 to 100 per cent. lower than some years past; yarn now $1 per bunch, ten years ago, $2; nails six cents per pound, ten years past, ten cents. Still their profits are much better than those engaged in raising the great staples of the state. But very few of our citizens are engaged in navigation, and fewer in ship-building. The capital invested by our citizens in commerce, bears a very small proportion to the capital invested in the agricultural products and staples of the state."

The Chamber of Commerce, of Charleston, through a committee, reply: Cotton, rice and Indian corn, are the principal staples grown in South Carolina; the two former only are exported. The capital employed in their production cannot be estimated at less than $150,000,000. The average profit is generally estimated at three to four per cent., and the difference in the average profit for the nine years preceding 1842, and for the three last years, may be inferred from the statements in another part of this report, in answer to other questions connected with the subject. The average price of cotton for the nine years preceding 1842, that is to say, from 1833 to 1841, was $12 $33\frac{1}{3}$, and for the three years from 1842 to 1844, $7 $33\frac{1}{3}$; of rice, from 1833 to 1841, $3 per 100 lbs., and from 1842 to 1844, $2 54 per 100 lbs. The state does not raise a sufficient supply of cattle, mules, hogs, Indian corn or oats. They are obtained from Virginia, Maryland, North Carolina, Tennessee, Kentucky and Louisiana. The committee cannot give at this moment their average price or value. All cotton goods, especially the coarser kinds, have been higher in the last three years, while cotton has been lower than it was ever known; rice, also, has averaged $2 54 in the last four years, and in the four years preceding 1842, $3 51 per 100 lbs. It is now bringing a much higher price, the crop being one-third short, but more particularly in consequence of the failure of the crops in Europe. The coarser manufactures of every kind, which enter into the daily wants of the masses, are always the most extensively consumed; and all of these articles have been relatively high in the last three years, as compared with the prices of cotton and rice. Timber and lumber are the only articles

of any consequence, the product of the state, besides the staples, that are exported.

Five-sixths of the cotton grown in the United States is exported and consumed abroad, and the same proportion may be assumed as correct in relation to that portion of the crop raised in Carolina.* Three-fourths of the rice grown in Carolina is exported and consumed abroad. The price of the former is governed almost entirely by the foreign demand, and the latter also, except in the summer months, when the supply is sufficient only for the home consumption, and there is a cessation of export. There have been several cotton factories established within the state in the last few years. Not enough is known of them to give the information asked. They are reported, however, to be doing a profitable business, and it is believed that they would be equally thriving with a fair revenue duty.

The growers of rice, cotton, and tobacco, in the last twenty-three years, have furnished 67 per cent. of the entire export of the country, and they are heavily taxed on all the articles used in their production.

The manufactures in the same time have furnished one-tenth only of the value of the entire export, and every article used in their particular branch of industry is either duty free or lightly taxed.

* Mr. Webster, in a speech delivered at one of the fairs in the interior of New-York, in 1843, stated that the consumption of cotton in the United States was equal to one-third of the cotton crop. Mr. Webster displayed great ignorance, or he practised a great imposition upon his hearers. The cotton crop of 1842-'43 was 2,378,875 bales, and the consumption (1842-'43) 325,129 bales, or one-seventh only of the crop, in round numbers. The crop of 1841-'42 was 1,683,574, and the consumption 267,850, being less than one-sixth; and the crop of 1844, 2,400,000, and the consumption 389,000, or less than one-sixth of the crop also. There is a good deal of cotton manufactured on the plantations for domestic use, and by mills in the interior of the southern states, but this can make no difference in the statement, as the whole quantity is relatively small, and the cotton so used is not taken from the ports, and is not consequently included in the crop, so that both items may be thrown out with perfect fairness.

It may be said that the decline in the price of cotton is to be attributed to an increase of production beyond the wants for consumption, but this is an error. The cotton crop of the United States of 1844 was 2,400,000 bales—the largest ever made; notwithstanding, the stocks in the American ports, on the 30th August, the end of the cotton year, were less than they were on the 30th August, 1844,..... 65,646 bales.

By the last dates from Havre, the stocks of American cotton were
less than last year, at same time..... 19,500

85,146

In Liverpool, they were more than at same time last year..... 64,300

Making a deficiency in stock of..... 20,846 bales, as compared with the same periods of 1844, notwithstanding a crop of 2,400,000 bales.

The stocks in the other continental ports cannot be stated, but they are not large. The stocks in spinners' hands in France are moderate. In England they are large, but much smaller, compared with the extent of their trade, than it was their practice to hold some few years since.

It is not unreasonable to assume, therefore, that had not the consumption been curtailed in the United States by the excessive duties on imports, and more especially those on the coarser kinds of cotton goods, the consumption of cotton at this time would not only have been larger, but quite sufficient to have kept pace with the production, without the disproportionate decline in price that has taken place between it and the articles manufactured from it.

The iron mines are extensive, and some small working by bloomeries have been made. These are of no consequence. There are three establishments for the working of iron mines, by blast furnaces, rolling mills, &c. They are located respectively in York, Union, and Spartanburg districts. To each establishment are attached considerable mines of iron ores. There are eight blast furnaces, three rolling mills, three foundries, and two nail factories, in the three establishments. They are worked chiefly by slave labor; their product varies from 3,500 to 4,000 tons of pigs to half that quantity. This is worked into castings, bars, nails, &c. Prices have varied considerably, being influenced more by the ability of consuming than other causes. The consumption is local, among the planting interests; and whatever depresses that, and diminishes its ability to consume, lessens demand and prices. Since 1842, the price of iron has been reduced from this cause some 30 per cent., until latterly it bears a better rate. This again is to be attributed to the fact that a drought of nearly two years has rendered the supply of water for the works often inadequate, and the production has been very considerably reduced. The price of iron in the markets that are supplied by these works, although affected, is not yet controlled by the tariff. Their location is so far in the interior as to constitute a protection against foreign competitors, and the cheapness of provisions and slave labor, with competent skill and management, will always render them independent of government protection.

Commerce.—The proportion that the capital in the state invested in commerce bears to the value of its staple products, cannot be correctly stated in figures. It is quite ample, however. The interest on money has been moderate and steady for many years, and capital can always be had at the legal rate of interest for all legitimate purposes of business. The commercial interests of the state have been much depressed for many years. The draining influence of the tariff has no doubt been a leading cause. The products of the soil are sold at low cash prices, and all articles of consumption are bought at high monopoly prices. The effect in a series of years must be increased poverty, a deprivation of comforts, and a crippled trade. The principal staple of the state, cotton, rates lower in price than it has ever done, while in Europe and America all manufactures, especially of cotton, are higher than they have been for years.

Ship-building.—Charleston was at one time engaged in ship-building to some extent, and many ships were owned by its citizens. There are now very few ships owned by them, and the vessels built annually are very few, and generally of the smallest class. The high duties on iron, chains, cables, and other articles of outfit, renders them costly in proportion to the cost of British vessels; and the competition from these, and the small direct import trade from Europe, renders it unprofitable to own them. American tonnage has not increased in the same proportion as British tonnage, in the last ten or fifteen years. Even in the ports of the United States there has been a great increase of foreign vessels in the last few years.

The amount of foreign tonnage employed in the trade of Charleston

and other southern ports is more remarkable. By the table it will be seen that the foreign export of South Carolina in 1844, was $7,429,585. Of this amount there was exported in American vessels $3,202,386, and in foreign vessels $4,227,199. There were 238 American vessels entered the port in the same year, or 49,801 tons, and 159 foreign vessels, 48,926 tons.

4. GEORGIA.—From this state there are a great many answers, and they are almost as full as those from South Carolina.

The President of Richmond Factory, near Augusta, gives average profits before 1844, 19 per cent., since 25 per cent. per annum; planting interest yielding 5 or 6 per cent.; employ 50 persons; wages 10 to 50 cents per day; mostly women and children, employed all the year, 12 hours a day. Wages of agricultural laborers 50 cents a day; plough boys $4 a month and board. Market for cotton goods at home, also New-York and New-Orleans.

John Fontaine, for Columbus cotton and wool factory, answers—capital $50,000. First four years no profit; since then 20 per cent.; spins annually 300,000 lbs. cotton, half in yarn, rest in osnaburgs. Spins also 25,000 lbs. of wool into heavy negro cloths. Uses mostly domestic wool. Employs seventy hands, mostly women and children; average wages $9 per month, houses being furnished them, but they providing board and clothes. Work 10 to 12 hours a day, all the year. Market for goods, Georgia and South West. 200 persons reside at the factory. Whole amount of cotton manufactured in Georgia, 10,000 bales.

Mr. Bulloch, in relation to Roswell Factory—manufactures cotton and wool; capital $70,000; profits 20 per cent.; employ 112 men, women and children; average wages $1,50 per week; work 12 hours a day, all the year.

Manufactories in Georgia: Roswell factory, Cobb county, (given above;) Athens manufacturing company, Clark county; Georgia company, Clark county; Columbus company, Muscogee county; Elbert company, Elbert county; Scull Shoal company, Green county; Eatonton factory, Putnam county; Upson company, Upson county; McCalpin factory, Upson county; Schley's factory, Richmond county; Rock Mills factory, Hancock county; Deametre's wool carding factory, Baldwin county; Thomaston manufacturing company, Upson county; Waynman's manufacturing company, Upson county. He also states that "associations have been formed in Columbus, in Muscogee county, and in Augusta, Richmond county, which promise manufacturing establishments upon an extensive scale;" that the capital of the "Athens Manufacturing Company (established in 1836) is $94,000;" and that the answers given in the case of the "Roswell factory, to the questions propounded, will, in a great measure, elucidate the affairs of all the others." That "the Athens company last year divided 24 per cent., with as good a prospect for the present. Increase of profits arises from an increasing demand in the states of North Carolina, South Carolina, Alabama and Louisiana. 1,000 bales, or 350,000 lbs. cotton, at 5 cents, is the annual consumption, amounting to $17,500. Wool

consumed, $2,000. No goods of like character imported from abroad." [The latter remark is general, and applies to cotton and woollen manufactures of Georgia.] "Average number of men, women and children, 75 to 80—all white—largest proportion, women. Cost of the manufactured article to the manufacturer has undergone an annual decrease in the value of the materials. Labor stationary; average labor, 12 hours. Manufactures sold for cash. Supposed profits on capital otherwise employed in the county and state, about 12 per cent. The Georgia manufactures require no protection. Similar manufactories exist in North Carolina, South Carolina, Alabama and Tennessee; but to what extent is not known. No manufactories of salt in Georgia, but several of iron in the counties of the Cherokee country, beyond the reach of foreign competition, and commanding a ready market in the neighborhood. Decatur, in De Kalb county, manufactures to some extent—cannot tell whether they have been influenced by the tariff of 1842." Mr. Bulloch also states, that "a correspondent, and one largely interested in one of our manufacturing establishments, states that 'no manufacturer will abandon if his profits yield 10 to 12 per cent., and that one of the shrewdest northern manufacturers (Mr. Merrill) of New-York, who has a factory near Athens, and is now concerned in building an extensive one on the Oconee river, in Green county, told me the present rate of duties was a large protection, and he expected to retire with a fortune before competition could bring it down to 12 per cent. profit; that our factories in the interior increase their profits by having a store from which the operatives are supplied, and also the re-sale of articles received in barter; that any number of operatives can be had in Georgia, whose average wages will not exceed $1 50, and no reduction of duties will now stop the increase of manufacturing establishments; and a war with Europe would not deprive us of the necessaries of life, and materials for army and navy. The aggregate capital invested in manufacturing establishments in Georgia must amount to a million of dollars, and is rapidly increasing. The profits upon such investments are considered greater than on that of any other species of property. Duties beyond a revenue standard seem not to be required, even by those engaged in manufactures."

James Cumming, of Savannah, answers for the agriculturists.—"Income per hand of slaves, $35 since 1842, 50 to 60 dollars usually. Cotton and rice are the articles of product and exportation, and support all the business of the state. Profits not more than five per cent. The product of cotton has been unfavorable for some years, compared with previous results. Public opinion has varied considerably as to the cost of producing cotton—some five, some six, some seven cents per pound; but this depends on lands, location, &c. At ten cents at the shipping ports, a fair profit reaches the planter, leaving 7½ to 8 cents on the plantation. That price has been uncommon since 1842. In 1844–'45, cotton did not average more than six cents at the ports, gross, 1½ cent off for expenses. Tonnage partially or wholly owned in the state; does not exceed 7,000 tons. Gold is found in various parts of the state, and worked

to some advantage; iron mines are coming into use, on a moderate scale."

Robert Habersham, of Savannah, answers: "State does not raise sufficiency of horses, mules, hogs and cattle; amount imported very great. About four-fifths of the articles made for export are consumed abroad, the prices being governed by the foreign demand; principally shipped to England, France, Germany and the West Indies; the East India rice comes in competition with that grown by us; the high duties imposed by the tariff lessen our ability to meet that competition successfully, by inviting high duties in return on our staples, in the countries which consume them. We have 20 or 30 manufacturing establishments in the state; they manufacture cotton goods; capital employed over $1,000,000. Profits for the last three years considerable, say 20 per cent. per annum. The duties increase their profits, but are not necessary to keep them in operation at a fair profit; a moderate duty would make them as productive as those growing the great staples. The state has not been engaged in ship-building, except to a limited extent. The capital engaged in commerce bears a very small proportion to that invested in agriculture; probably not one-twentieth. The commercial interests have, to a limited extent, been affected by the tariff; to what extent, cannot say."

Mr. George, Inspector, gives the value of the crops of cotton and rice of Georgia, 1845:

296,535 bales cotton,	*a* $21	$6,227,235
8,009 " (Sea-Island,)	$70	560,630
28,232 casks rice,	*a* $20	564,640
		$7,352,505

PRICES GEORGIA SEA-ISLAND COTTON.

1832	20½	1837	40¼
1833	15	1838	31¼
1834	22½	1839	40
1835	37½	1840	24
1836	43½	1841	23¾

Mr. Smetz estimates the lumber exported from Savannah as tenfold what it was 25 years ago.

EXPORTS, 1845.

Steam sawed,	$155,000
River lumber and shingles,	19,000
Ranging lumber,	42,000
	$216,000

Amount of same articles for home consumption, $100,000. Number of hands employed as great as would produce 65,000 bales of cotton. This business renders lands valuable which are unfit for the cultivation of cotton; this business is also beneficial to the navigation interests; this branch is steadily increasing; the forests afford supplies which are inexhaustible. A sudden impulse has been given also to another branch, in consequence of the article being admitted, by a recent act of Parliament, free of duty, into British ports,

viz: *oak staves.* This article, almost unknown amongst our exports, will hereafter figure as an important item. The quality of the oak is said to answer better in the English market than the northern oak. In the English market, Georgia pine enjoys an undisputed pre-eminence over all other American pines, &c., &c.

5. ALABAMA.—There are but two or three meagre reports. An iron and brass foundry at Mobile, averages 25 per cent. profit, and makes $8,000 in castings, and $7,000 in repair of steamboats per annum. Plenty of iron ore, but none worked in the state.

Mr. Benson, in reply to Circular No. 1, states, that "there are three cotton factories in the state; one in Bibb county, a joint-stock concern, established in 1835; two in Tallapoosa county, (one owned by Barrett & Marks,) established in June, 1845; capital $30,000, no portion of it borrowed; 15 per cent. profit on capital; employ 30 hands, one-half being their own slaves. The other owned by two individuals; established about one year. In Autauga county is an extensive manufactory of cotton gins, which turns out about 500 annually. All these employ water-power. In Benton and Talladega counties there are several furnaces and forges; water-power. A furnace at or near the city of Mobile; steam-power. Cannot state the amount of business. The profits on agriculture do not exceed 3 per cent., exclusive of the increase of slaves, &c., &c."

Mr. Fraser: "State does not raise sufficiency of horses, &c.; no ship-building; gold mines are worked in Randolph and Tallapoosa counties; iron ore in Talladega."

6. FLORIDA.—Robert Mitchell, Pensacola: No manufactories in Florida, except for salt and segars, etc. A. Gordon, Key West, says, salt is the only article manufactured in this district. The manufactory on this island was commenced in 1834. Present capital, exclusive of real estate, $24,500; a joint-stock concern. Annual rate of profit 8 per cent. on the cash capital, after deducting expenses. 30,000 bushels manufactured last year. Average 23 cents per bushel. Quality greatly superior to the imported, being purer and heavier, weighing 86 lbs. to the measured bushel, while that from Turk's Island and Exuma, weighs but 72. Seven persons employed; negroes $15, white $25, per month. Sales for cash, and the principal markets, New-Orleans and other places along the Gulf Stream. Foreign articles of an inferior quality do enter into competition in other places, but not here. Price has decreased from $37\frac{1}{2}$ to 23 cents, in consequence, in part, of the decreased duty on the foreign article. Dividends 8 per cent.

S. R. Mallory, Key West: Florida produces cotton, rice, tobacco, corn and sugar-cane. Raises sufficiency of horses and mules, and provisions. The section of country on the coast, south of Jupiter inlet, and east of Cape Sable, produces a native arrowroot, commonly called "coontée," which is manufactured by the settlers to some extent, not to exceed 20,000 lbs. per annum. This commanded in northern markets, in 1835–'40, 8 cents per lb.; and is now, in the same markets, worth 5 cents. No vessels built, though

ship-timber abundant. Samuel W. Spencer, Apalachicola: Nearly four-fifths of the capital of the state is engaged in the production of cotton for export, and corn for home consumption. Several of the counties on the river contiguous to this, to wit: Jackson, Gadsden and Leon, have occasionally produced some sugar, to the amount perhaps of 100,000 lbs.; tobacco is quite a large crop in the above counties, and will amount this year to 800,000 lbs., all of which will be shipped from this port to St. Mark's. Average income per hand, since 1838, $75. The state does not raise a supply of horses, mules or hogs; the horses and mules are mostly brought from Tennessee and North Carolina; a large quantity of hogs were driven from Tennessee and the northern part of Georgia, to supply the counties on the river. There is also a large quantity of western bacon received at this place from New-Orleans for the interior of Florida, say 20,000 lbs. No articles manufactured in the state, except coarsest cottons and woollens. No mines worked. Robert Myers, Apalachicola: No ship-building; the only manufactories of the state are for segars, and sawing boards, &c., which require no protection; the profits are ample, but cannot say what; capital about $600,000.

7. Mississippi, but two returns: Adams county cotton factory; no profits yet; employs 20 black men, 6 women and 4 children; works 8 hours—300 days. John D. Elliott, collector at Natchez, did not know of any other factory in Mississippi. H. Hobbs, of Jackson, says, products of state—corn, wheat, rye, oats, barley, grains, grasses, stock, cotton, rice and tobacco; whole industry engaged in producing cotton.

8. Louisiana.—Leed's foundry at New-Orleans, for the manufacture of heavy machinery, answers: Amount invested, $250,000; annual profit 10 per cent. on capital; manufactures sugar-mills, saw-mills, cotton-presses, steam-engines, &c.; 130 men employed; mechanics wages, $2 50 a day; laborers, $1 50. Orleans Sugar Refinery answers: Capital $60,000; 2,500,000 lbs. raw sugar of domestic growth used; 35 hands employed; average wages $35 per month.

Judge P. A. Rost* contributes a most interesting letter, which we publish very nearly in full:

"Sugar and cotton are the main agricultural products; rice and tobacco are raised to a limited extent; large quantities of hay, corn and potatoes, are also raised for the use of the plantations; these are consumed in producing the crops of sugar and cotton.

"The capital engaged in the cultivation of sugar is increasing rapidly, and may now be stated at $75,000,000, about $12,000,000 of which consist of buildings and machinery, exclusively applicable to the manufacture of sugar. The capital engaged in the cultivation

* E. J. Forstall communicates voluminous and valuable papers, some of which we have previously digested, and others we shall refer to in coming numbers of the Review.

of cotton is about $90,000,000; that engaged in the cultivation of rice and tobacco, does not exceed $1,000,000.

"More than half of the sugar and molasses raised, is exported by sea to the other states, and shipments are beginning to be made to England. All the remainder, except the consumption of New-Orleans, is carried by steamboats to the markets of the Mississippi valley. It must have required, this year, shipping to the extent of 100,000 tons to take away the sugar and molasses that went to the markets of the Atlantic coast. The amount of inland tonnage employed to carry the crop to New-Orleans, and the portion taken by the west to the inland markets, is still greater. The extent of shipping required to take away the cotton crop of this state is 100,000 tons, and an equal quantity of inland tonnage is employed in carrying it from the plantation to the New-Orleans market.

"The New-Orleans merchants receive a commission of two and a half per cent. upon the gross amount of the sales of our products; and the price is generally paid with the proceeds of bills which the bankers of that city discount at the current rates of exchange. This shows the vast extent to which the commercial and navigation interests are dependent upon our products. The mechanical and manufacturing interests are equally so. The increase in the cultivation of sugar is so great, that there has been all this season a scarcity of sugar-house machinery. The supply is not equal to the demand. A single iron foundry in Tennessee has sold, this season, $50,000 worth of sugar-kettles, and would have sold more if it could have supplied them. Planters procure their provisions, corn and coal from the west—their clothing and machinery from the north and west. The machinery used for grinding, clarifying, boiling, granulating and refining sugar, is all domestic, and is superior to the machinery made abroad for the same purposes. New-York and Philadelphia furnish us with vacuum pans which London and Paris cannot match. The cotton planters require less machinery, and are turning their attention to the manufacture of their people's clothing. The bale rope and bagging which they require, has brought into existence the extensive manufactures of those articles which now exist; the building of sugar-houses and the putting up of machinery, employ a great number of mechanics, and their wages are gradually rising.

"I own a sugar plantation on the Mississippi river, upon which I reside. Twenty odd years ago, I established a cotton plantation on Red River, and I am still interested in its products. The land of both is fertile, the climate favorable to the products raised, and the cultivation equal to the average cultivation of Louisiana. Out of the three years last passed, two have been very favorable for cane, and one has been unfavorable. The average clear profit of the three years on the sugar plantation, has been seven per cent. upon the capital invested. Upon the cotton plantation the crop of 1842 was fair, and yielded a net profit of six and a half per cent., notwithstanding the low prices. The two following crops were half destroyed by the overflows and the army-worm. The total income

of the two years, was hardly seven per cent. The present season has been seasonable and free from accidents. The crop, if it can be picked, will amount to at least 150,000 pounds clean cotton, which, at an average price of seven cents, will produce $10,500. The expenses of cultivation, bailing, transportation and sale, will not exceed $3,000, leaving $7,500 profit upon a capital of $75,000; that is 10 per cent. Many persons, discouraged at the repeated appearance of the army-worm, are leaving cotton to cultivate the sugar-cane. Cotton, at from six to seven cents a pound, is a more profitable crop than sugar ever can be.

"I did not own the sugar plantation during the ten previous years; I learn that the average profits during that time were about the same, the only difference being in the value of the currency during the two periods. On the cotton plantation, the average profits of the ten years should have been over ten per cent. in the currency of the times. The place was badly conducted, however, and raised bad cotton part of the time; hence the small profits.

"The average annual income per hand on the sugar plantation, from 1842 to 1845, has been $175; and must have been the same in the ten previous years. On the cotton plantation, since 1842, the worm and overflows have caused in two years the loss of a whole crop; counting those two years for one, the average would be $145 per hand; and if the crop now on hand were included in the estimate, the average would be near $160 per hand. In comparing the profits of the two cultivations, it should be remembered that the fixed capital on a sugar plantation working a given number of hands, is much greater than that employed on a cotton plantation having an equal number; and that the difference consists principally in buildings and machinery, subject to great wear and tear. So that the income per hand, in the cultivation of sugar, may be greater, while the profit on the whole capital is less.

"Cannot state the amount of the products of the state consumed abroad. Very little sugar has, as yet, been shipped to England, and the Louisiana cotton is mixed up, in New-Orleans, with that of other states, and sent partly to the north and partly to Europe. I do not believe that the foreign or home demand regulates exclusively the price of those staples. If a month hence news were received of a great rise in the price of sugar in England, and 20,000 or 30,000 hogsheads were purchased here at advanced prices for that country, it could not be said that the price of that sugar was governed by the home demand; and as the quantity shipped would necessarily increase the price of the remainder, that price itself would not be regulated by the home demand exclusively. The cotton of Louisiana is principally shipped to England and France. In the English markets we are met by the competition of the cottons grown in India. The duties imposed by the present tariff do not perceptibly lessen our ability to meet that competition successfully, and they gradually create a market for us, which will be more and more necessary as that competition increases.

"This state does not raise a sufficient supply of horses, mules, cat-

tle, hogs, salt provisions, corn, and coal. Mules are supplied by Kentucky and Missouri, coal by Pennsylvania and Kentucky; the other products by all the western states; cannot state the average value of the supply each year,—it amounts, however, to several millions of dollars. During the expansion of the currency, the price of all these products had been greatly increased; and, when the reaction took place, they fell below their intrinsic value. Under the operation of the tariff of 1842, the price of all has gradually improved; provisions and mules are now too high for the present prices of sugar and cotton."

9. TENNESSEE.—Hugh Harkins of Bolivar, and Thomas K. Porter: Annual profit agricultural hands on cotton, $110; state raises its supply of everything. Agricultural products: corn, cotton and tobacco, hemp, wheat, &c. Three-fourths of capital of state in agriculture. Average price corn, previous 10 years, $1 00 barrel. Exports iron and spun cotton to other states; numerous iron works, furnaces, forges, rolling mills, cotton and woollen factories in Tennessee. Steamboat building beginning to take root at Nashville; iron mines worked.

William Williams, Nashville: There are five or six factories to spin cotton, and one or two weave cottons and linseys; several others are soon to be put in operation. Some years past two or three steamboats were built at Nashville. It is said they are now built on better terms on the Ohio. Upwards of $100,000 are sent from Nashville for steamboats.

10. OHIO.—R. Dickinson, Sandusky: State produces wheat, corn, pork, oats, potatoes, butter, cheese, tobacco, wool, &c. Wheat and corn are the great staples; the former mostly converted into flour; the latter into pork and beef. Capital employed in agriculture may be estimated at 300,000,000 dollars; in mines, commerce, and manufactures, estimated at $60,000,000; capital employed in agriculture being thus five-sixths of the whole amount employed. All the interests named are connected with and dependant on agriculture. The commerce of the lakes, rivers, and canals, consists of transporting the agricultural productions of the state. These have created her commerce and navigation, and are almost the only productive industry of the state that will sustain other interests. Average profits on capital employed on well-conducted farms, for the last three years, in Ohio, after deducting incidental expenses, will not amount to 3 per cent. The prospects of agriculturists are extremely discouraging. The annual profits of capital employed as above, from 1832 to 1842, from 4 to 6 per cent. The price of wheat, from 1832 to 1842, at the lake shore in Ohio, about $1 per bushel; from 1842 to 1845, about 70 cents per bushel. State raises sufficient supply of horses, mules, hogs, cattle, meats, and other provisions. Exports pig iron, lumber, furs, peltries, pot and pearl ashes, &c. The flour, wheat, corn and pork shipped directly to foreign countries go to Canada; those indirectly go to Great Britain and dependencies, Brazil, South America, Spanish Islands, &c. Our citizens on the lakes and rivers

are extensively engaged in ship-building and navigation. The capital invested is large, amounting perhaps to $1,000,000.

The amount of wool is rapidly increasing; probably 6,000,000 lbs. now produced annually. Average price for the last three years 33 cents per lb. Cannot say what was the price per lb. for the ten years preceding 1842. We have coal and iron mines in abundance in Ohio. At least 20,000 tons of pig iron is produced annually in this state. The price has advanced since 1842 from $18 to $25 per ton.

W. M. Correy, Cincinnati: State produces about $40,000,000 in provisions, horses, mules, &c., about one-half of which is exported. There are manufacturing establishments of almost every kind; and some in great perfection. Their aggregate capital is now not less than thirty millions of dollars; profits for the last three years have been great, judging from the fact that money can be loaned at 10 per cent.; and yet it is tending strongly to these establishments. This state builds annually about 50 steamers, at a cost of about $1,000,000; the greater part of which is owned and navigated by the citizens of the state.

Elwood Fisher, Cincinnati: The west, including the states of Kentucky, Ohio, Indiana, Illinois, Missouri, and Michigan, and the Territories of Wisconsin and Iowa, had a population, in 1840, according to the census, of 4,131,370 persons, not quite one-fourth in number of the Union. In that year, the exports to foreign countries of products of the forest was $5,323,085; of farming, $18,771,075; both amounting to $24,094,160. These we assume went from the west, because they can be delivered in Canada, the West Indies, and England, to which they are chiefly shipped via the lakes and the Mississippi, cheaper than from any other part of the Union. In the same year, the export of tobacco was $9,883,957, of which one-third was western product. If to these we add the bale rope and bagging which enveloped the cotton export of that year, and which was supplied principally by Kentucky, we shall have an aggregate of more than thirty millions of western produce out of the total domestic exports, which amounted to $113,895,634. So that the west, with much less than one-fourth of the population, supplied more than one fourth of the exports to foreign countries direct; besides the enormous quantity of her provisions consumed in the south, which entered into the production of cotton, and found their way in that shape to foreign ports—probably not less than ten millions more. Now, as the other sections of the Union possess much more capital than the west, they must, with the same population, produce more in value; and since their contribution to foreign commerce is less than ours, it is obvious that the proportion of our products, dependent on foreign commerce, is much the greatest. Agricultural produce is the natural want of a dense commercial and manufacturing population like that of Europe, and the natural product of such a soil and people as the western. If this trade is maintained, *the west will supply other sections of the Union with many manufactured fabrics*, the proceeds of agricultural products, for by this process cloth is obtained by the plough cheaper than by the loom. It is apparent, from the magnitude of western exports in 1840, that this operation was actually

going on; the west, receiving in exchange for its produce manufactured goods more than it wanted, exchanged them with New-England and the Middle States for fish and such other manufactures as could not be profitably imported from abroad.

11. KENTUCKY.—Agent Louisville Manufacturing Company states: amount invested as capital, &c., $100,000; profits 6 per cent.; produce 750,000 yards bagging and 750,000 lbs. rope, annually; consume 1,100 tons hemp, at about $55 per ton; employ 80 men, 20 women, 70 boys and girls; men's wages $3 to $9 per week; women, $2 to $4; boys and girls, $1 to $3; work 12 hours the day. These wages 25 per cent. higher than in other employments in the state, from a supposed unhealthiness—same as at the north. Cost of manufacturing bagging since 1837 has decreased from 10 to 5 cents per yard; hemp in yard decreased 10 cents; total saving to consumer 14 cents per yard. Rope, price in 1839, 9 cents per lb; in 1840, 8; 1842, 6; 1843, 5½; 1844, 4½; 1845, 4. In United States, $3,000,000 of bagging and rope manufactured annually, of which Kentucky produces ¾. This supplies the whole American demand. (Bagging) was formerly imported from Dundee and Calcutta chiefly; —no rope of consequence has ever been imported. When there has been a general failure of the hemp crop, or any other cause to produce a material advance in the price of rope, Sisal and Manilla (which are foreign product) have been brought into this country and made into bale rope. Tariff or no tariff has little or no effect at this time on the bagging manufacturer, for the reason that domestic competition in its manufacture has brought it below a price at which it can be imported *without the payment of duty;* and for the reason that the cultivation of hemp has been greatly extended in Missouri, Tennessee, Illinois, Indiana, and in this state, until more is grown than is required for the bagging, bale rope, and cordage factories. The Goulding Bagging Factory produces 1,000,000 yards bagging, worth 9½ to 10 cents; profits on capital, 3 per cent.; consume 1,100 tons hemp, at $70; price bagging 1842, 16; 1843, 14; 1844, 12; 1845, 9½ and 10 cents. Product bagging in the United States, 18,000,000 yards; in Kentucky, 13,000,000; consumption United States, 15,000,000 yards.

Lewis Saunders answers: "Tobacco only, of the three named staples, is produced in this state; quantity, from forty to fifty thousand hogsheads; mostly sent to New-Orleans, thence to the eastern cities and to Europe; the remainder sent to Pittsburgh and manufactured at home.

"Kentucky produces for sale, besides tobacco, horses for the saddle, harness and plough; cattle, mules, hogs, sheep, poultry, beef, (*mess and prime,*) pork, (clear, mess and prime,) lard, oil, corn, oats, hay, potatoes, apples and other fruits, whiskey, cotton bagging, bale rope, negro clothing, hemp and wheat.

"These are the principal articles produced for export; and, except the article of hemp and a portion of those of beef and pork, in barrels, and a part of the whiskey, the remainder (four-fifths) is consumed by the cotton and sugar planters of the south; they are our best and only customers, except for tobacco, hemp, and pork.

Prices for our productions are ruled mainly, if not entirely, by the price of cotton and sugar. When the price of these articles is up, planters pay us good prices; our prosperity depends upon them. If they are depressed by the tariff, or other causes, we feel the depression also.

"We have numerous iron works, making the various kinds of *castings*, bar, rolled and slit iron, and nails, mostly consumed in the state; negro clothing sold in large quantities to the cotton and sugar planters. This article is made of cotton warp, filled with common wool; no foreign article can compete with it. Some cotton factories for spinning and weaving; productions mostly consumed in the state; a reduction of the tariff would but slightly, if at all, affect this interest. For an estimate, class the sheep of Kentucky at 1,000,000, mostly in small flocks; every farm has some. I know of but few large flocks in the state; nine-tenths of the wool is used by families in a domestic way; prices have been so low within the last three years that farmers are not inclined to increase their flocks.'

A. Beatty answers: This state raises a sufficient supply of horses, mules, hogs, and cattle, and of meats and other provisions of all kinds, for its own use, and a large surplus of each of those articles for export. Besides the agricultural products, the state exports large quantities of cotton bagging, bale rope, twine, and other cordage, jeans for negro clothing, wool, lard, tallow, bees-wax, feathers, and various small articles, such as skins, furs, &c.

12. INDIANA.—J. Nelson, Fort Wayne: Products, wheat, corn, rye, oats, buckwheat, potatoes, flax and hemp, are raised extensively throughout the state. None of the staples of cotton, rice, or tobacco raised, except the latter, which is cultivated quite successfully and to a considerable extent in the interior, south-eastern, and south-western portions of the state.

Not 2 per cent. profit last three years on agriculture.

In this, the northern portion of the state, the profits of well conducted farms for the ten years preceding the last three were very large; should think not less than 10 per cent.

During most of the period above alluded to, produce was very high; wheat was worth from $1 to $2 per bushel; corn from 4*s.* to 12*s.* per bushel; other grain proportionably high. For the period of three years, since 1842, wheat has ranged from 50 to 65 cents; corn from 1*s.* to 3*s.* per bushel; other grains alike low.

John F. Reed, Jeffersonville: There are 13 cotton manufactories, with a capital of $160,000; tobacco, number not known, capital $70,000; 426 tanneries, capital $400,000; 600 saddleries, capital $270,000; 40 woollen, capital $90,000.

The quantity of wool raised in this state is about one and a half millions of pounds.

13. ILLINOIS.—Returns several, of which we shall give substance. State produces wheat, corn, oats, tobacco, hemp, flax, grain, pork, beef; profits agriculture, 2 to 4 per cent., formerly 5 to 10. Mines of lead, iron, copper and coal; first named produced extensively.

Products of state, 1845, $60,000,000 from wheat alone; $10,000,000 as an exportable surplus. Raises full supply of hogs, horses, cattle, &c. Exports lead, whiskey, flour, pork, beef, wool, &c. But few manufacturing establishments in the state. Little ship-building or navigation; little commerce.

14. MICHIGAN.—M. Hinsdill: Agricultural products exported, wheat and wool; ten factories of wool in the state, none extensive; large number of small furnaces for making ploughs, &c.; two or three manufacture steam engines. State builds large numbers of vessels for navigation of lakes; no mines except those of copper on Lake Superior.

15. MISSOURI.—Thos. Gantt; Products, large quantities of tobacco, hemp, wheat, Indian corn, and oats; little cotton, and no rice. Besides these immediate products of the soil, pork and beef are grown in great quantities. There are manufactories of tobacco, iron, queens-ware, sugar-refining, and a cotton factory at Hannibal. Boat-building has engaged some capital of the state.

For the last three years the profits of the best conducted farms, and those most favorably situated, have been about 5 per cent. This is about the *maximum* of profit. In many cases the profits have been from 2 per cent. to nothing.

During the greater portion of the previous ten years, fair profits upon the capital employed were realized—say from 5 to 15 per cent.

Mines of lead have been long worked, but in an unscientific manner; but enlightened capitalists are now improving this interest, and the quantity sent to market from this state is rapidly increasing. For the last six years the price has been from $2 to $3 50 per cwt.

16. ARKANSAS.—No particulars.

17. WISCONSIN.—Various answers: Produces wheat, corn, rye, oats, vegetable wool, and some tobacco. Exports nothing but furs and peltries; has a few small woollen factories; lead and copper mines; no exportations of agricultural produce before 1842; raises sufficient supply of horses, mules, hogs, and small surplus of bread-stuffs. Wisconsin produces principal portion of the lead of the Upper Mississippi; Galena and Potosi points of shipment; net profits of agriculture 2 per cent. on best lands. Income per hand clear from 1836 to 1839, $100; 1840 to 1841, $25; 1842 to 1844, $10. Wisconsin has four or five iron foundries; as many tanneries; two or three woollen factories on a small scale.

18. IOWA.—No mines except lead. These yield annually about 4,000,000 lbs. of lead, obtained by the labor of between five and six hundred men, requiring no great capital besides. Lead sold for $2 per 100 lbs. from 1833 to 1835; from 1835 to 1837, at about $4; from 1837 to 1842, at $2 50; and at an average of $3 per 100 lbs. from 1842 to the present time. The high price of 1836–'37 was chiefly caused by an inflated paper currency; and the present advanced price is caused by the great demand abroad.

Although lead brings $3 per 100 lbs. at present, it is known that those engaged in its production are not as well paid for their labor as any other class of men in the country; and, in proof of this assertion, submits the following estimate made out by several of our most experienced and practical miners:

Capital invested, $50,000, at 6 per cent. per annum	$3,000
500 laborers for one year, at 75 cents per day, say	112,500
Powder, tools, candles, &c.	37,500
Total cost of producing	153,000
4,000,000 lbs. of lead, at 3 cents per lb	120,000
Annual loss to producers	$33,000

Or, after deducting the actual expense, tools, interest, &c., it will leave a net product of $80,500 to be divided among 500 men, or $161 each per annum, out of which they pay for boarding about $78; leaving but $83 as the earning of each working man for one year, or less than 28 cents per day.

Art. IV.—THE SWORD AND THE OLIVE BRANCH.*

J. D. B. De Bow, Esq.:

Eschewing politics, you will not expect from me an essay, to disturb the even tenor of your Magazine, in its march of Commerce, Literature and Science. Abhorring factions, I would not scribble a line to favor one, or put down another. Therefore, in defending a great commander in his opinions of his rights and the dignity of his office, I shall touch only upon a branch of the military art which can give no offence to any one.

To the commander-in-chief, in an offensive campaign, the sword is consigned, with some general object of the war, its lines, &c. To go with him into minute details, is not only harassing, but vicious, and he would be defended by the example of Prince Eugene, in returning to the Aulic Council, at the end of the campaign, their despatches unopened. Killing is not the object of war, but impressions made upon an enemy and its territory to reduce its strength, and to abate its inclinations for prolonged contest. Hence, the Sword has a better office than slaughter. The Olive Branch may effect more than steel and bullets, opportunely offered or accepted. To deprive a commander of this branch, is excluding him from a main road to victory. Minerva would not have carried off the crown from Neptune, in the judgment of the gods, if the olive tree had no signification but its berries. Our American Eagle would be less one arm, if the olive branch should be snatched from its talons. The

*This paper is from the pen of a military gentleman of high character in Louisiana, and is interesting in many respects, without offending against any of the rules of our periodical.—Ed.

right claw holds the branch, and the left the darts, which furnishes an apt illustration of its character. Now, if the chief represents the war eagle of the nation, to give him on his banner a bird of one leg, would not represent the Bird of Jove, nor the power of the Republic, nor the might of the commander-in-chief. No general would march with such a banner, nor would his troops rally under or around it. "*Vincere facem*" could not be intended under such a flag, nor would "*facere pacim*" be concluded under the influence of its stars or stripes.

Hannibal, during 17 years in Italy, represented Carthage, and carried no separate civil commissioner amidst his ranks.

Cæsar, in his Gallic campaigns, marched as he pleased, and treated according to his tastes, fighting and making peace, subduing, or making allies and tributaries, and no civil commissioner would have dared to show his face near the eye of Cæsar, or beside his victorious legions.

If the son of Hamilcar had a Hanno for his enemy at Carthage, and the Great Julius had his Pompey at Rome, neither they nor their subalterns, in regular pay, or private hire, would have dared to exhibit themselves in the fields of contest.

Let us now see how, in modern times, Bonaparte managed this thing in the fields of Italy. I quote freely from the memoirs, as it is most proper to use the General's own language. Bonaparte said: "The alliance of France with Sardinia is like that of a giant embracing a pigmy; if he stifles him it is against his will, and merely owing to the extreme difference of his organs." The Directory was not willing to comprehend the wisdom and profundity of this policy; it authorized the opening of negotiations, *but threw obstacles in the way of their conclusion.*

When Mantua opened its gates, Bonaparte (marching on Tolentino, to *dictate* the terms of peace to the Holy See, and place himself in a situation to march on Vienna) perceived the importance of bringing the affairs of Piedmont to a close, and authorized General Clark to negotiate with M. de Saint Marsan, a treaty. Here we read *dictate,* which is conquering a peace in earnest. The commander appoints a commissioner. Had General Bonaparte the powers? He did not ask for them, and did not care to ask. They belonged to him in his office of military commander, and he appointed negotiators to follow his instructions.

In another part of his Memoirs we read:—Napoleon had no need of this increase of difficulties; he was already menaced by Alvinzi, whose troops assembled in the Tyrol, and on the Piave. He *reproached* the French Directory with having left him ignorant of negotiations, which he alone was able to direct. Had he been appointed to direct them, (as ought to have been the case,) he would have delayed opening them for two or three weeks, in order to have received sixteen millions due from the Holy See, by virtue of the armistice of Bologna. The government acknowledged this, and invested him with authority to remedy its blunders if possible. He directed the French agent to disown, confidentially, all the spiritual

part of the negotiations of Paris and Florence; to intimate that the General was entrusted with the negotiation; and that neither the Commissioners nor the Directory had anything to do with it, but the General alone. These overtures produced a good effect. To make a greater impression, the General went to Ferrara, alighted at the house of the Cardinal Mattei, archbishop of the city, and had several conferences with him; he convinced him of his good intentions, and got him to set off for Rome, to carry words of peace directly to the Pope. A few days after, the battle of Arcole put an end to all the hopes which had been raised in Italy by Alvinzi's army. In a few days Napoleon re-passed the Po, and proceeded to Verona. The battle of Rivoli destroyed forever the hopes of the enemies of France. Mantua opened its gates. A small Gallo-Italian army marched on the Appenines. All disputes with Rome were settled by the Treaty of Tolentino.

The Directory sent instructions to General Clark to sign a treaty, on condition, &c. *These were not approved by Napoleon, who thought that the Republic had a right to regain the limits of the Rhine, and a state in Italy, &c.* Three months after, Napoleon signed preliminaries, on condition of the limits of the Rhine, with the fortress of Mentz, and the existence of democratic republics in Italy—communicating with Switzerland—barring all Italy from north to south—from the Alps to the Po—surrounding Sardinia, and covering middle and lower Italy. In case of necessity, the French armies, debouching by Geneva, Parma, Modena and Bologna, would at once reach the Piave, after turning the Mincio, Mantua and the Adige. This would secure the kingdom of Sardinia and the states of the Church, and Tuscany, and the kingdom of Naples.

The French army resolved to pass the Julian Alps, and to march on Vienna. Such is the contrast between the genius of Napoleon, and the Directory and Clark combined. Such will always be the contrast between a skilful commander-in-chief, and cabinets and civil commissioners

The battle of Tagliamento, of Tarwis, of Geritz, and the entrance of the Italian army into Klagenfurth and Layback, astounded Vienna. The armies of the Rhine and the Moselle, and the Sambre and Meuse, were to have opened the campaign, and passed the Rhine on the same day that Bonaparte passed the Piave, and were to advance into Germany. The government, on the 23d of March, wrote to the General, complimenting him—stating why the armies of the Rhine had not taken the field, and assuring him that they would march without delay. But three days after, the Ministers wrote that Moreau's army could not effect the passage of the Rhine for want of boats, and that the army of Italy must rely upon itself alone. Was the Directory fearful that these armies, if united under one General, would make him too powerful? Napoleon, thus fettered, and not having sufficient cavalry to descend into the plain of the Danube, thought he might advance to the summit of the Simmering, and use his position to conclude a peace. He wrote to Prince Charles as follows:—"Whilst brave troops carry on war they wish for peace.

Have we not killed men enough, and inflicted sufficient misery on the human race? Humanity calls loudly upon us. Europe has laid down the arms she took up against the French Republic. Your nation alone remains; yet blood is to flow more copiously than ever. Fatal omens attend the opening of this campaign. Whatever be its issue, we shall all kill some thousands of men on both sides; and after all we must come to an understanding, since all things have an end, not excepting vindictive passions. You, General, whose birth places you so near the throne, and above those petty passions which often actuate ministers and governments, are you disposed to merit the title of benefactor to the whole human race, and the Saviour of Germany? Do not imagine, sir, that I mean to deny that it may be possible to save Germany by force of arms; but even supposing the chances of war should become favorable to you, the country would nevertheless be ravaged. For my part, General, if the overture I have the honor to make to you should only save the life of a single man, I should feel more proud of the civic crown I should think I had thereby merited, than of all the mournful glory that the most distinguished military success could afford."

Prince Charles replied: "Most certainly, General, whilst I carry on war in obedience to the call of honor and duty, I am as desirous as you are of peace, for the sake of the people and humanity." The Prince declined, fearing to assume the responsibility, and concludes: "But whatever may be the future chances of war, or the hopes of peace, I beg you to be convinced, General, of my esteem and peculiar consideration." In order to support this overture, the French general marched forward to approach Vienna. After the battle of Unzmarkt, the army met with no other resistance, and its van reached Leoben. Lieutenant-General Bellegarde, and Major-General Merfield, presented themselves before the French general with a flag of truce, and desired an armistice for ten days. The French general replied, "that a suspension of arms in the military position of the armies, is wholly prejudicial to the French; but if it is to prove a step towards peace, he would consent to their wishes." The armistice was to expire in five days, but it was prolonged to seven days longer—a measure important to the French. General Clark, with full powers, was at Turin As it required time for him to reach head-quarters, Napoleon took the responsibility (as on many other occasions) and signed the treaty with Merfield and Gallo. The limits of the Rhine were granted to France. The Oglio was to limit the Austrians. The French armies gained the Cisalpine Republics of Lombardy, Modena, &c., and Venice, and could communicate from Milan to Venice by the right bank of the Po, and debouche on the Piave, and disregard the lines of the Mincio, the Adige, and Mantua. Napoleon might have entered Vienna, but this would have produced no good effect, as he could hardly maintain himself there, the armies of the Rhine being unable to take the field. The Councils and Directory were at variance; there was difference among the directors themselves, and Moreau wanted money to organize his pontons. The directory had authorized General Clark to

sign much less advantageous terms. Napoleon, therefore, signed the *preliminaries.*

Hoche commanded the army of the Sambre and Meuse, and crossed the Rhine at the bridge Neuwied, attacked Kray, and compelled him to fall back on the Maine. Hoche arriving before Frankfort, hears, through the Austrians, of the treaty of Leoben—assumes Friedburg for head-quarters, and occupies the Nedda and Wetzlan. Moreau was at Paris soliciting pontons; but Desaix, who commanded *ad interim*, finding that Hoche was engaged, crosses at Kilstett; Moreau comes up; the Austrians are beaten, and the General halts, hearing of Leoben. Hostilities did not commence on the Rhine until eight hours after the treaty of Leoben had been signed, and Napoleon received the intelligence seven days after. Why was not the campaign commenced sooner, and why had the Directory written that the co-operation of the armies of the Rhine was not to be reckoned upon? "But (says Napoleon) the affairs of the war were conducted without energy or talent, (meaning the civil part of the affair,) and the administration was *corrupt*, and never produced any satisfactory result."

Hoche was young, full of talent, bravery and ambition, had a superb army of 80,000 men under his command, and burned to imitate the deeds of the army of Italy. The army of Moreau was large, and well composed. Desaix would have done better, as he loved glory for glory's sake, and France above everything. He was unsophisticated, active, of a pleasing character, and of extensive information, and had perfectly studied the theatre of war upon the Rhine. Besides, he was attached to General Bonaparte, and was not eaten up by the jealously which devoured Moreau. Bonaparte had but 43,000 men, and 120 pieces of cannon. What could the Directory design by keeping these armies asunder, and leaving Bonaparte to operate singly? The General of Italy charged that ministry with *corruption* and *imbecility*, as the best and only answer!

Let us now advance to the peace of Campo Formio. The real object of General Clark's mission was not to open a negotiation, but to act as secret agent of the Directory at head-quarters, and to watch the General, whose victories began to give umbrage. Clark's genius was not military; he was an *official* man, *exact* and *upright* in *business*, and a *great enemy of knaves.* Napoleon was glad that the government employed a man who was known, rather than subaltern agents, who pick up the most absurd information in ante-chambers and taverns. Napoleon employed Clark in several negotiations with Sardinia, and the princes of Italy. After Fructidor, he defended him warmly, not only because he had gained his esteem in a delicate mission, but because it became him to grant protection to a man who had been in daily communication with him, and of whom he had no ostensible cause to complain. Conferences began at Udine. General Clark alone attended on the part of France. Napoleon declared he would not attend unless the Austrian ambassadors were sincerely desirous of peace. Napoleon went to Montebello and Milan. Clark being recalled, Napoleon was now the only commis-

sioner on the part of France. Count Cobentzel and three other commissioners represented Austria. The moment the Austrian negotiators were convinced that they could only obtain peace by adhering to the terms proposed at Montebello, the treaty could have been signed, had not the Directory changed its policy. *Since the affair of the 18th Fructidor* they thought they might *require from the nation new sacrifices.*

They contrived intimations to Napoleon, calculated to induce him to break off the negotiations and recommence hostilities, whilst the official correspondence was still dictated in a spirit of peace. It was evident they wished for war, but were anxious that the *responsibility* of the rupture should rest entirely with the *negotiator.* When they perceived that this plan did not succeed, and when they believed their own power was established, they sent their ultimatum. Napoleon had fixed ideas respecting the degree of obedience which he owed to his government. With respect to military operations, he thought it his duty to execute his orders so long as they seemed reasonable and likely to succeed. His ideas respecting the degree of obedience due from him as plenipotentiary, were not so well settled. Could he renounce his mission in the midst of a negotiation, or thus hazard its results, by executing instructions which he did not approve, and which would result in war? But his principal character at Passeriano was that of general-in-chief. He resolved to sign the peace on the terms settled at Montebello, which, *before* the *18th Fructidor* had been *approved* by the *Directory.* Count Cobentzel required, he said, "the Adda as a boundary, or nothing." Austria yielding Belgium and Lombardy, Mentz, four departments of the Rhine, Savoy and Nice. They therefore insisted on the Thalweg of the Adda. They were forced to reduce their claims to the line of the Mincio. This, said Count Cobentzel, is our ultimatum. The conferences were held within hearing of the drums. Count Cobentzel remained immoveable; his carriages were got ready, and he announced his departure. He said that the French negotiator would be responsible for all the blood that would be shed in this new contest. Upon this, Napoleon, with great coolness, although much irritated by this attack, arose, and took from a mantel piece, a little porcelain vase, which the Count prized as a present from the Empress Catharine, "Well, (said Napoleon,) the *truce* then is at an *end,* and *war is declared;* but, remember, that before the end of autumn, I will shatter your monarchy as I shatter this porcelain." Saying this, he dashed it furiously down, and the carpet was covered with its fragments. He then saluted the Congress, and retired. The Austrians were struck dumb. A few minutes afterwards they found, as Napoleon got into his carriage, he had despatched an officer to the Archduke Charles, to inform him that the negotiation was broken off, and that hostilities would re-commence in twenty-four hours. Count Cobentzel, greatly alarmed, sent the Marquis de Gallo to Napoleon, with a signed declaration, that he consented to the terms of the French General. The treaty was *dated* at Campo Formio, a small village, which had been neutralized for this purpose by the

Secretaries of Legation, but signed at Napoleon's head-quarters, at Passeriano.

I doubt if Clark, or any one else, could have exhibited more firmness or diplomacy than the commander-in-chief of the army of Italy. I doubt if Mr. Trist, or any one else, could have made as good a treaty, or as promptly, as the general-in-chief of the army of Mexico, looking to "*indemnity for the past, and security for the future.*"

If I have not said enough to fortify my original position, I have not leisure to say more. But, perhaps, this essay, if studied in the right spirit, will prove pregnant enough.

Hereafter, if subjects of this sort are not unsuited to a magazine, which hangs up King Commerce for its motto, you may hear again about boundaries, &c., from your correspondent, H.

Art. V.—THE BRITISH COLONIAL EMPIRE.

THE following graphic sketch of the British Colonial Empire, on which, it has been well said, the sun never sets, we extract from the first number of that able London publication, the Colonial Magazine, which we have often commended to our readers. This sketch will be followed up, at an early day, with another by ourselves, showing the extent of the trade, population, area, etc., of all these provinces, and their importance to the mother country.

We will start with BRITISH INDIA. With that Hindostan will we begin, which, out of a population of one hundred and forty millions of human beings, has ninety millions subjects of Great Britain, forty millions of the subjects of allies, protected however by the British Government, and greatly dependent upon British support, and with but ten millions of subjects of independent states.

Where the Jumna and the Ganges, two rivers destined to give grandeur and fertility to the plains of Hindostan, burst from beneath the eternal snows which no mortal foot hath yet trodden, still in the most elevated recesses of the mountains, Britain has her empire, and the soil is her own. In that India which was one of the earliest seats of civilization, laws, the arts, and of all the improvements of social life, there are we now omnipotent. In that India which is an epitome of the whole earth, extending from the 8th to the 34th degrees of north latitude, and from the 68th to the 92nd degrees of east longitude, which from north to south is no less in length than 1800, and from east to west 1500 miles, there are we! It has regions that bask beneath the brightest rays of a tropical sun; and others, than which the most awful depths of the polar world are not more dreary. In its vast plains, which present rich double harvests, luxuriant foliage, and even the burning deserts of the torrid zone: in its low heights, enriched by the fruits and grains of temperate and mellow climates; on its upper steeps, clothed with the vast pine forests of the north; and even on the highest pinnacles of its loftiest regions, buried beneath the perpetual snows of the arctic zone;—even there are we! On the great plain of India, between the Brah-

mapoutra and the Indus, reaching across from the great chain of mountains to the high table land of the southern peninsula, 1500 miles long, and from 300 to 400 broad, there does British influence exist, and there also is the British name respected and revered. Along that plain where the Ganges pours a continually-widening stream, and where the power of vegetation is so great as to render it an entire field of waving grain,—there are we! Where in the east, on the hilly shores of Malabar, the aromatic gales perfume the air of the Oriental Isles—there our name, our power, our good faith, are known, acknowledged, and felt. Where the rice, the opium, the indigo, the cotton, grow in the greatest profusion;—there are we! Where nature ever riots in unbounded luxuriance, and covers whole tracts of country with dense, dark, impenetrable masses of foliage and vegetation, crowded and twined together; with trees spreading on all sides their gigantic arms; with thorny and prickly shrubs of every size and shape, and with canes shooting in a few months to the height of sixty feet;—there are we! And where in the open plain the banana and other single trees, when full scope is given to their growth, spread out into the dimensions of a considerable forest;—there are we! Amid the wilds of India, where tall and majestic forests of pine, larch, spruce and silver fir, cypress and cedar grow, flourish and decay, still there we are, the owners of the soil, and either the governors of the people, or their protectors and friends.

Where the fruits of the earth luxuriate in abundance and perfection; where the wild rose, the lily of the valley, and the cowslip burst through the green carpet; where the chamois bounds from rock to rock, and the forests are filled with deer and with musks; where the peacock displays his glittering plumage on the lower hills; where the sovereign eagle is descried amid the cliffs; where the bold hawk and the roving kite prey upon their dependents and their victims;—there are we!

In the valleys of the Sutledge and the Jumna; amidst perpetual snows, where, beyond a succession of lofty eminences, a central mass of an enormous chain of mountains exists; by the side of the cataracts which dash down dark ravines unsung by poets, and as yet unpainted by the pencil of man; in those bright and beauteous groves, or in the woods and forests where the gibbon, the wanderoo, the ichneumon, the pangola, the rhinoceros, the nyl-ghau, and the gayall are to be found; and where the finch falcon of Bengal, the hawk owl of Ceylon, the bulbul, the honey-sucker, the coromandel, and the gigantic stork walk or fly abroad at liberty and in happiness;—there also are we!

Napoleon once said that "England was a nation of shop-keepers!" We meet the foul libel by pointing to our Indian colonies! A nation of shop-keepers, indeed! What! was that a nation of shop-keepers—a few of whose merchants with a handful of troops struggling against European rivalry, subdued all the states which had sprung from the ruins of the Mogul Empire, and became the arbiters of the destiny of one hundred and forty millions of human beings placed at

the opposite extremity of the globe? Was that the effort of men who count coppers on counters, and speculate on short weight and inferior goods for their profits and their fortunes? No! No! the conquest, the retention, the aggrandisement, the improvement, the continued rule and yearly advancement of such a dependency as this, is too mighty a monument of British courage, zeal, perseverance, science, and wisdom, ever to be forgotten in the history of the world!

Next in importance to the East Indian possessions of Great Britain, are those of the West Indies. There is JAMAICA, that "island of springs," with its four millions of acres—with its blue mountains towering to nearly 8,000 feet above the level of the sea—with its dense woods offering a marked contrast to the lower ranges—with its coffee, pimento, cotton, and capsicums—with its numerous ravines and savannahs—with its springs, its harbors, its ports, its beautiful bays, its rich mines, its fine sugar canes, its coffee plants in the mountains, its dye stuffs and spices, its arrow-root and cassia. There the bread-fruit tree, the plantain, the banana, the shaddock, the tamarind, the guava, and the star-apple all arrive at perfection.

There is TRINIDAD too, presenting one of the most magnificent, variegated, and richly luxuriant panoramas that nature ever formed. The waves of the mighty Orinoco dispute to the east for the empire of the ocean with contending billows, whilst the lofty mountains of Cumana rise from the bosom of the horizon in stupendous majesty. The fecundity of the soil, its gigantic and magnificent vegetation, its beautiful rivers, enchanting slopes, forests of palms, groves of citron and forbidden fruit, and hedges of spices and perfumes—its fine azure skies, deep blue seas, fertile glades and elastic atmosphere, have obtained for Trinidad the title of "the Indian paradise."

There is TOBAGO, once the abode of the Caribs, and named after the first tobacco pipe of the island. It offers a strange contrast to "the Indian paradise," for it is termed the "Isle of Melancholy." At some former period it formed a bold promontory of main land, from which doubtless it was violently dissevered. Though less picturesque than some islands, the fig-tree and the grape yield their fruit twice a year, and the cinnamon and pimento grow wild in different parts of this curious isle.

There is GRENADA, the most southerly of the Antilles, once a favorite possession of the French; with its mountainous and picturesque scenery, its successive piles of conical hills, it vast forest trees and brushwood, its splendid mount St. Catherine towering to a height of 3,000 feet, its basaltic rocks, its wondrous cliffs, and its fine cocoa, sugar, and coffee plantations. There is the pretty group of Grenadines or Grenadilloes.

There is ST. VINCENT, the most beautiful of the Caribbee isles, with its bold, sharp, and abrupt mountains, its deep intervening romantic glens, and its lofty and rocky coasts. The delicious valley of Buccament is the admiration of all travellers. The famed botanic garden is the theme of general praise; and the island stands high in reputation as a healthy station.

There is Barbadoes, the land of luxuriant fig-trees, and the territory of once as brave a people as ever breathed, with its beautiful bay of Carlisle, and noble square with the statue of Nelson; and there are also the remnants of those primitive forests which formerly covered the whole island.

There is St. Lucia, with its sugar-loaf rocks, its fantastic-shaped mountains, its lovely little coves and bays, fringed with luxuriant cane fields; its flotilla of fishing and drogher boats, and its stately trees clothing its noble mountains.

There is Dominica, with its lofty rugged acclivities, its fertile valleys, watered by thirty fine rivers—its umbrageous canopy of lofty and magnificent forests, and its romantic and picturesque cascades. The mountains are sulphurous and volcanic; its lofty table rock, Morne Bruce, is one of the finest in the West Indies; its rich parterres of green coffee perfume the whole atmosphere, and its grand savannah is the delight of all who enjoy the murmuring cascades of bubbling brooks which break through the luxuriant vegetation, or roll along the hilly avenues surrounded by piles of rocks, black, bare, or green with countless traceries of lovely creepers, gigantic ferns, and lofty palms.

There is the fertile island of Antigua, with its bays and harbors wholly unrivalled in the West Indies, with its bold and precipitous hills, its innumerable fruits, its aromatic spices, its productive gardens, and its groves of trees of beautiful and refreshing verdure.

There is the delightful little island of Nevis, the mother of the English Caribbee Isles. It is a four-mile mountain, yet as green as heart can conceive, perfectly cultivated, and with a forest of evergreens like a ruff round the neck of the high land.

There is Montserrat, the Montpelier of the west, with its elastic and healthy atmosphere—its majestic, picturesque, and lofty mountains, and its truly charming and bewitching scenery.

There is St. Christopher, (or St. Kitt's,) with its layers of volcanic ashes, its bracing air, its healthy inhabitants, its awful crag of Mount Misery, and its exquisitely beautiful vale of Basseterre.

There is Tortola, whose harbor has afforded shelter in time of war to 400 vessels waiting for convoy.

There is the eel-like Anguilla, with its little wall of cliffs rising from the beach and protecting a flat and uninteresting surface, but yet producing annually three million bushels of salt from its salt lake; and sugar, cotton, maize, and cattle in comparative abundance.

There are the Bahamas, a group of several hundred islets, evidently the work of the coral insect, which, with all its apparent insignificance, has created many beautiful and habitable spots for the dwelling and culture of man. In these numerous isles there are 400,000 acres granted to cultivators, and nearly two millions and a half vacant or unoccupied.

And there are The Bermudas or Somers' Isles, exceeding 300 in number, lying like a shepherd's crook, in the Atlantic ocean, with their coral reefs and shoals, their small cedar groves, their green-clad

hills; and that north rock, placed by Nature, or rather by the God of Nature, as a beacon which seems to say, "Hitherto mayst thou come," thou mistaken, billow-tost, deceived, and luckless vessel, "but no further." The Bermudas are the Gibraltar of our West Indian Colonies, and it was therefore that our American enemy, Washington, desired to annex them to the republic, and to make them a nest of hornets to annoy the English commerce.

Yes, there are we; amidst this variegated scenery, these mixed populations, these multiplied products of the West India Islands. There are we, who found the population uncultivated, indolent, ignorant, miserable slaves; and who have rendered them instructed, happy, enlightened, and free citizens. We have doubled the amount of productions by our superior cultivation; we have made their minds, by instruction, as productive as their soil; we have increased their staple products to such an extent, that their exports are now most important; and we have, in nine cases out of ten, so changed the indigenous characteristics of the people, as to have transformed them from dulness, stolidity, and soporific indolence, to comparative activity, brightness, and competition. To the charge that we rendered the Africans, slaves, we reply at least with triumph and with truth, that we have purchased their freedom. Yes, noble land of the brave and the good, we can look to our West Indian Colonies with gratitude, dignity, Christian joy, and honest pride; and as the once-captive race point to their broken chains now scattered around, we can say, "Thank God, we bought their freedom." *

Turn we now to South America, and to our colonies in that quarter; and the first which presents itself is British Guiana. There, on the vast rivers of Essequibo, Demerara, and Berbice, we have possessions which cover an area of one hundred thousand square miles. There its fine savannahs are occasionally interrupted by hill and dale scenery; but the general appearance of the country is similar to the territory of Belgium. Sugar and cotton grow in abundance; and in some districts, though never manured, a single acre has produced 6,000 lbs. of sugar in one year. In other districts, coffee is not only abundant, but of excellent quality. Although the climate has hitherto been considered one great objection to any vast amount of colonization in that portion of our possessions, yet exercise and temperance are, as elsewhere, the great safeguards to health.

The British settlement of Honduras, in Central America, extends along the coast for an extent of 270 miles. That coast is studded with green isles, and the town of Belize is by no means insignificant. The mahogany tree, and logwood, cochineal, indigo, and sarsaparilla, are the great staple produce of Honduras; oranges, shaddocks, melons, pine-apples, and cocoa nuts, are also abundant. Deeply is it to be regretted that the country is not divided into parishes, and that

* Our friend of the Colonial Magazine may be allowed his innocent enthusiasm here, but we think as little as possible ought to be said in England about that "emancipation bubble," which has been such a farce before high heaven. Our readers will refer to Commercial Review, Vol. V. p. 475, in proof.—[Editor.

emigration to that portion of our settlements is not encouraged. Its pine-wood alone would richly compensate all engaged in its cultivation.

The FALKLAND ISLES are no less than ninety in number, and the two largest are each nearly one hundred miles in length and fifty in breadth. Though the weather is seldom settled, yet the climate is temperate, and vegetation rapid and productive. There is heard the gentle note of the grele, and the falcon and the heron are by no means rare. There, too, herds of wild cattle would maintain vast numbers of settlers, and the upland geese would delight, by their flavor, even a London or a Parisian gastronome.

Our possessions in NORTH AMERICA merit a longer and more attentive consideration. First in order of importance comes what was formerly LOWER CANADA. The late settlement of the Maine frontier question has deprived us unquestionably of one of the finest sections of our North American territory, but it is still sufficiently extensive to support in comfort and happiness tens of thousands of our depressed and emaciated agricultural population. Two hundred thousand square miles of territory, with three chief districts—Quebec, Montreal, and Three Rivers—and two of an inferior extent—Gaspé and St. Francis—ought to be far better cultivated and much more thickly populated than they are at present. And are not the natural features of Lower Canada extremely picturesque? Are there not ranges of mountains, noble rivers, magnificent cascades, lakes, prairies, farms and forests, alternating in every direction with sudden and beautiful variety? Who that has seen the eastern parts of the river St Lawrence, with the high and mountainous districts about it, can forget the noble forests which everywhere meet the eye, and which are lost only in the clouds! And who can forget the Alleghanies, rising abruptly to the lofty elevation of 4,000 feet above the level of the sea? Of cities and towns there are sufficient to assure the minds and remove the fears of settlers; for are there not Quebec and Montreal? And though the winter be somewhat longer than our own, its fine season begins in May and continues until November. When last the census was taken, in seventeen counties there were upwards of 4,100 townships, and a population of nearly 500,000 souls. What forests of timber there invite the industry and the activity of our broad shouldered and strong-limbed foresters! How many a man whose family now scarcely exists upon the wholly inadequate wages of the mother-country, would there be abundantly compensated for his labor and his toil!

If from Lower, we turn to the position of UPPER CANADA, what a vast territory do we behold embraced in that extensive province! Who can even think of the Ottawa River—of the Lakes Ontario, Erie and Huron, without strongly feeling what sources of riches are there, in primitive forests as yet untrodden by the foot of civilization? The lakes alone fill us with surprise. Lake Superior is 541 miles long, by 140 wide; and Huron, Erie and Ontario, are from 180 to 250 miles in length. The infant capital, Toronto; Kingston, hitherto the seat of government, with its fine position, but little

inferior to Quebec and Halifax; the Rideau Canal, the Welland Canal, the Granville Canal,—all are works of interest to those who exclaim with delight as we do, when their eyes pass over in succession the various nations of the earth, "Yes, there also are we." And when we think, too, that the people of Canada are among the most favored of the earth, having peace, liberty, security and abundance—a fertile soil, a beautiful climate, and an almost total exemption from burthens of any kind, how can we do otherwise than desire that swarms of our manufacturing, mining, and wandering poor were there, enjoying at least the comforts, if not the luxuries of life?

Thank God that some districts are colonized by Highland and Lowland Scotchmen, whose prudent, thrifty, hard-working characteristics have fitted them for emigration. There are upwards of eighteen acres of rateable land to each human being, and not more than two acres cultivated. And when it is known that even there, where the advantages are so great, that the proportion of hands cultivating 57,000 acres is as twenty acres to each person, is it not just and right, that we should desire that multitudes of our own starving population should there be transplanted to labor with diligence, but to be well rewarded for their toil?

Nova Scotia is situate between the parallels of 43 and 46 north latitude, and the meridian of 61 and 67 west longitude. It is 280 miles long, embraces upwards of 15,000 square miles, and nearly ten millions of acres. The harbor of Halifax is the admiration of the world, and from its situation being directly open to the Atlantic, and its navigation scarcely ever interrupted by ice, is our chief naval station in North America, and affords safe anchorage for 1,000 ships. Yes, there also the majesty of Britannia rides triumphant on the wave!

Cape Breton and The Sable Islands, though forming a part of the government of Nova Scotia, are yet, as it were, a separate colony. They comprise an area of two millions of acres, exclusive of the surface covered by lakes and rivers. How beautiful is the situation of Sydney, the capital, and how enterprising and energetic are the miners! What depths of coal-fields, and what sources of riches are there still hidden! The veins appear to be wholly inexhaustible; and yet, besides all this, timber exists in great abundance, and the fisheries are sources of wealth.

New-Brunswick next invites our notice. It contains no less than nearly 28,000 square miles, and about eighteen millions of acres. Behold its bold undulations, its vale and lowlands, its noble forests, its pleasing settlements, its abundant water communications, its fine extended prairies; and yet, fourteen out of eighteen millions of acres still await the British husbandman to turn the soil of this province with British spades, and to rescue millions of the half-starving population at home from misery and death. The province is healthy, old age is frequent, and sober, industrious settlers cannot fail of being happy and contented.

Prince Edward's Island is no large possession, containing an

area of 1,360,000 acres, or 2,134 square miles; but it is delightfully situated for commerce, agriculture and the fisheries. It is a pastoral country: picturesque, admirably adapted for cultivation, and so healthy that many persons live even to one hundred years of age, without ever knowing a day's illness! There, however, the fisheries have been neglected, and hundreds of the famishing fishermen on our eastern and northern coasts would find in the herring fishery of Prince Edward's Island, means for a profitable and satisfactory existence.

NEWFOUNDLAND AND THE LABRADOR COAST are likewise under British dominion, and owe a loyal obedience to our Queen Victoria. Newfoundland is not less than 420 miles long, and at its greatest breadth 300 miles. Little is known of the interior of this vast island; but it would doubtless well repay the toil of those who should decide on exploring it. The longevity of the inhabitants is the best proof of the salubrity of the country. Old fishermen of 90 years of age will be frequently seen, actively occupied in the arduous duties of their calling. How astonishing is British industry and British enterprise! Look at Newfoundland for an example of this! There, in a land certainly "unknown to song," there are nearly a million cwts. of dried cod prepared and exported annually, and from 400,000 to 500,000 seal-skins likewise sent to foreign shores in the same period of time.

THE HUDSON'S BAY TERRITORIES occupy no less an extent than four thousand miles. True, the human race is but scanty in this immense region; but the Hudson's Bay Company's settlements are commercially important, and furs are the chief object of their profitable trade.

These are our North American colonies. If the government of this country would direct its mighty energies to their gradual but steady colonization, what beneficial advantages would result, both to the colonies themselves and to our rapidly-increasing, and only partially-employed, home population!

If we turn to that EAST with which we commenced this view of our Colonies, we shall find, in addition to India, which we have already noticed, the large ISLAND OF CEYLON—containing a superficial area of nearly 25,000 miles—but of great importance in all its resources of trade and commerce. There, lofty mountains run in continuous chains, with the most lovely valleys the sun ever shone on, between them. There, the hills are clothed to the very summits with gigantic forests, from which issue magnificent cascades and dashing cataracts. There, the lovely valleys, placid rivers, and rippling brooks are fringed with turfy banks, and all the beauteous verdure of the tropics. Ceylon has been aptly called "the Malta of the Indian Ocean." Its commercial capital, Colombo, is a mile and a quarter in circumference, and is well defended. Its maritime capital, Trincomalee, is, as Nelson described it, "the finest harbor in the world." Its climate is salubrious and delightful; its productions, animal, vegetable, and mineral, are profuse and perfect. Its population, both native and European, is healthful, con-

tented, prosperous, and happy. The state of general education and religious instruction could not well be more satisfactory. The population is upwards of a million souls; and its products are numerous and beautiful, valuable and important. And there are we, respected, honored, and beloved!

PRINCE OF WALES'S ISLAND, or Pulo-Pinang, when compared with the mighty Ceylon, of which we have just been speaking, is small indeed; but it is of considerable importance, whether viewed in connexion with the Anglo-Eastern Empire, or separately, as containing commercial stations and political maritime positions. The island is picturesque, vegetation is splendidly luxuriant, and the mountain forests are magnificent. Small villages and Malay topes are scattered over the island amidst spice-groves in the valleys, or on beautiful and romantic sites upon the sea-coast. The harbor of Georgetown is capacious and well defended. The trade of Pinang is very considerable; the population is 60,000; and nature is most rich and luxuriant.

MALACCA and SINGAPORE are also entitled to a distinct notice; but we must hasten to our possessions in AUSTRAL-ASIA, and commence with NEW SOUTH WALES.

This vast island of New-Holland, with a width of 3,000 miles, a breadth of 2,000 miles, a superficial area of more than three millions of square miles, and a coast line of 8,000 miles, is one of those of our possessions, the magnitude and importance of which it is impossible for us, at this distance, adequately to comprehend. The rapidity with which this colony has advanced, is one, amongst many proofs, of its admirable climate, situation, and capabilities. It was not until 1788, that the British ensign was hoisted on the shores of Sydney Cove, then thickly wooded and abounding in kangaroos; but the silence and solitude of the forest were soon broken in upon, by the resounding strokes of the woodman's axe, and a few settlers, imbued with that moral and physical courage which Britons possess in so eminent a degree, have erected its Sydney, its Parramatta, its Liverpool, its Windsor, its Richmond, its Newcastle, its Macquarrie, and its Maitland—and month by month its counties within, and its settlements without the boundaries, are becoming increasingly fertile and prosperous. The salubrity of New South Wales is proverbial; the staple products are such as cannot but secure wealth to all engaged in their cultivation and export; the fisheries are varied and valuable, and none of our colonies is so rapidly advancing in population, wealth, and civilization.

WESTERN AUSTRALIA, or SWAN RIVER, was founded by four English gentlemen—Messrs. Peel, Vincent, Schenley and Macqueen. Its origin must be dated from the 1st of June, 1829—a period of little more than fourteen years' distance, and through evil and through good report these gentlemen and their followers have proceeded with energy and industry, in their admirable and successful efforts. The seasons are steady and uniform; the rains return in their set time, and there is no drought in the land. The cattle thrive; vegetable matter is productive; the colonists are constantly

increasing; the staple products are becoming valuable and numerous; and Swan River is at least a promising colony.

Another portion of New Holland has been erected into a British colony, termed SOUTH AUSTRALIA. Its site is well selected, its climate decidedly fine, its natural products numerous and of a good quality, and several thousands of Europeans are now occupied in establishing a colony which shall one day justify the honest pride of every Englishman.

The quality of the soil, the extent of navigable waters, and the salubrity of the climate, are all most cheering circumstances to those who take an interest in British colonization.

VAN DIEMAN'S LAND covers an extent of 24,000 square miles, or fifteen millions of acres, and is itself nearly the size of Ireland. The country is mountainous but diversified; the coast is well supplied with bays and harbors. Hobart Town, the capital, is an extensive and well-built place, and its Mount Wellington and Derwent estuary protect and embellish it. Its exports have indeed wonderfully increased in ten years from £14,000 to £420,000 per annum. This is another of those colonies which are satisfactory in their past history, but which present prospects yet far more brilliant—and there are we!

If we turn to AFRICA, we shall find that in that continent of the Sun, where it exercises the most power, and appears to be least congenial to the health and longevity of man, still British colonies of a grand and imposing character are to be found. There too are we! In SOUTHERN AFRICA, the colony of the CAPE OF GOOD HOPE first presents itself to our notice, with a sea-coast of 1200 miles, and an area of 200,000 square miles. Its chains of mountains are magnificent. The capital, Cape Town, has been built along the shores of Table Bay. Its pastures are of a character highly favorable. It is well wooded with large timber, and watered by upwards of one hundred rivers and streams. The soil is fertile, and it has produced three crops of Indian corn in one year. The Boers have of late, indeed, manifested some dissatisfaction with the Colonial Government; but that has been but a temporary evil, and the population is steadily proceeding in the work of a good and permanent system of colonization. The salubrity of the country admits of no question; and the commerce, staple products, and property, are all in an ascending movement.

The MAURITIUS, or ISLE OF FRANCE, contains 676 square miles, is one of the most picturesque and romantic islands in the Eastern hemisphere, and possesses many bays, arms of the sea, and promontories. Its soil is exceedingly productive; its climate very salubrious; its dependencies numerous and valuable; its population 40,000; and the excess of its revenue over its expenditure gradually improving.

ST. HELENA contains but 30,300 acres, and is alone celebrated as the grave of a man who could never understand the genius of liberty, and who uttered to the last the most unmerited calumnies against Great Britain. The inhabitants are healthy, and about 5000

in number. The climate is salubrious; its soil is watered by clear and wholesome springs; and, before the overland route from India to this country was established, St. Helena was a spot of some note. It is still useful as an English colony, and there can be no question of its abandonment, but it is a heavy annual charge to the mother-country, and its revenue bears no proportion to its expenditure.

Ascension is contiguous to St. Helena. It is small, and is of volcanic production: but its turtle is its chief recommendation, except during war, when it is by no means an unimportant possession.

In Western Africa we possess that gloomy and unsatisfactory colony, Sierra Leone. Let it not, however, be forgotten, that the British colonies on the western coast of Africa are inferior to none in moral, political, and commercial interest. They are, in fact, an indispensable link in the maritime empire of Britain.

Gambia, Cape Coast Castle, (celebrated as the grave of the poetess, L. E. L.,) and Accra, are likewise to be included in the foregoing remarks; and although we deeply deplore the mortality which from time to time has swept away excellent governors, and admirable merchants and colonists, yet abundant reasons can be supplied why these colonies should never be resigned by Great Britain.

Before we turn to our European colonies we must not forget our new colony of New Zealand, and our more recent settlement at Hong Kong. With regard to the former, our sway is but modern, and it is divided; recent events have, of course, excited anxiety and apprehension, and we have yet much to do before we can encourage settlers to proceed in great numbers to New Zealand. But climate, soil, natural productions, are all in favor of this young colony, and we shall watch with intense interest its rise and progress. Of Hong Kong we know but little; it is one of the results of our Chinese conquest. Will it be one of the most satisfactory? Is its climate healthy, and suited to our European settlers? This at least appears doubtful. The Chinese evidently regarded it with suspicion, and its cession to England was no proof in its favor. It is by no means impossible that at some future time Hong Kong may be abandoned, and that a new colony may be demanded of the Emperor of the Sun in exchange for that apparently unhealthy settlement.

The British colonies in Europe are few, but valuable.

Gibraltar is the key to the Mediterranean, and is not the least remarkable possession of the British Crown.

Malta, and its adjacent island Goza, are the two colonies most envied by Europe. It is not that the length or breadth of Malta is great—nor that its productions are important—or its population numerous,—but it is commanding in its position, acts as a constant sentinel over European powers, preserves the Mediterranean from becoming the seat of conspiracy and intrigue against British interests, and enables us to assert our power, and to maintain our influence, in the south of Europe.

The same observations will apply to the septinsular cluster of the Ionian Isles, extending from the Albanian coast, to the southern extremity of the Morean peninsula. The seat of government is at

Corfu; the length of the island is about thirty-five, its breadth about twelve miles, and its climate is nearly tropical. But, besides Corfu, there are Cephalonia; Zante, the glory of the Levant; Santa Maura, a mass of mountain; Ithaca, a shapeless combination of huge rocks; Paxo, with a port of good anchorage, and Cerigo, where Ptolemy was once the lord.

And last,—far, far removed from the spicy groves and aromatic odors, from the glowing scenery and the rich forests of the lands of the mountain and the flood, to which, in these observations on our colonies, we have directed the attention of our readers, is situate, in the North Sea, our colony of HELIGOLAND. There, at only a few miles distance from the mouths of the Elbe, the Eyder, the Weser, and the Jahde, has England placed a sentinel to watch over her commerce and protect her navy. There England has her noble light-house, serving as a beacon to the world; but there she keeps up a good school of pilots, and maintains her supremacy and her glory as still "Mistress of the Waves." Thus it is, and thus may it ever be, that wherever commerce is to be conducted, trade to be carried on, manufactures to be placed, mankind to be civilized, Christianity to be extended, education to be promoted, and the great family of man to be improved—there are we!

We ought, perhaps, to say something of Fernando Po, of Aden in the Red Sea, and of the Island of Socotra; but these are scarcely entitled to notice, and cannot with propriety be denominated colonies. Some also would include Guernsey, Jersey, and the smaller contiguous isles, as well as that of Man, where the laws and customs are peculiar. But all of these are rather dependencies of the British Empire, than colonies, in the usual acceptation of the term.

We have said enough. To recapitulate even the titles of our colonies, is a source of honest satisfaction and of national pride; and to feel that when we carry to a new settlement the British flag, we at the same time plant the standard of science, the arts, letters, civilization, morals and religion, is a motive for exultation and for joy. But as our influence is great, so are our responsibilities to man, to society, to our colonies, and to Heaven. God forbid, then, that when we point to our northern and our southern, to our tropical and to our arctic possessions, and exclaim, "There are we!" it should be supposed we are indifferent to the conditions on which we *are* there. No! if we were there as absolute and tyrannical rulers—as masters indifferent to the happiness and prosperity of our dependents—as colonists sacrificing the welfare of the natives to our love of lucre—as nominal Christians indifferent to the moral and religious education of the people—as mere grinding task-masters, hard exactors and strong-headed proprietors of the soil—then most heartily would we exclaim, God grant we may soon be there no longer! But it is precisely because in British ships we export British civilization and liberty—the liberty of time-honored institutions, and of a limited monarchy, that we exclaim right joyously and in all sincerity, as we point to our list of noble and glorious colonies—Yes—THERE ARE WE!

Art. VI.—THE MERCHANT FLEETS AND NAVIES OF THE WORLD.

"The armaments which thunder, strike the walls
Of rock-built cities, * * * *
* * * * * * *
The oak leviathans whose huge ribs, &c."—BYRON.

EVERY classical reader will remember that famous catalogue of ships from all countries which Homer furnishes us, before the walls of Troy. After the fame of their deeds and the pomp of the enumeration, we are surprised to reflect they were but "open row-boats of canoes!"

The Greek fleet, 600 years later, at Salamis, was but half-decked; the soldiers being stationed on platforms at each extremity, and the middle of the frail boats was left open for the rowers. The vessels composing the expedition of Nearchus into India long afterwards, were row-gallies, capable of being hauled on shore with convenience, and not comfortable enough to allow the mariners to remain two consecutive nights on board!

The Romans began to build their navy on the model of a Carthaginian ship thrown upon their shores; and the vessels were of so large a size when Julius Cæsar invaded England, that they could not approach near enough to the shore for the soldiers to disembark; "but they were obliged to jump into the water, which was breast-high."

The northern Sea Kings, who spread such terror over Europe after the downfall of the Roman power, covered every sea with their fleets, which had no other guides than the sun by day and the stars by night. Their vessels are described as large, flat-bottomed boats, of light timber, the sides and upper works of wicker, with a covering of strong hides. They were transported on wagons from one river to another. It can scarcely be credited that these vessels were used on such perilous voyages.

But we have not time nor space to follow with particularity the slow progress of naval and maritime architecture from these rude beginnings. It would, without doubt, be a most interesting study.

Our purpose is now to take up the leading powers of the world, and exhibit their respective naval and maritime strength, by a consultation of the best and latest authorities within reach.

1.—GREAT BRITAIN.

"Look at the already immense number of powerful steam-ships that swarm in the waters of the Mediterranean, and enter every port upon its beautiful shores; that are found careering in every sea of Europe, from the Frozen Ocean to the Bay of Biscay and the Black Sea: that have long since driven every other mode of transit out of the Euphrates and the Red Sea; that penetrate the Indus

almost to its source; that ascend the Canton river, in spite of every obstacle, besides myriads of war-junks, and batter down the walls of the ancient celestial cities; that are surrounding every island and entering every harbor in the West Indies; that swarm along the shores of North America, from the Gulf of St. Lawrence to the Isthmus of Darien; and that regularly transmit the rich produce of the mines of South America, from all its principal ports on the east and west side to the great commercial metropolis of the world—crowded, busy London. Look at all this, and see what an element she has to sustain her in her onward march for empire. At no period did Great Britain possess such a foundation for naval strength within her bosom as at present. She now possesses 3,500,000 tons of shipping, and numbers 160,000 seamen in her commercial navy, while a fleet of seven hundred steam-boats (more than is possessed by all the rest of Europe) prowl along her shores."*

In 1793, the British navy consisted of 153 line of battle ships, hulks and vessels, on the stocks.

LINE OF BATTLE SHIPS OF ALL NATIONS, 1793.

France	86	Denmark	24
Spain	68	Portugal	13
Russia	36	Turkey, Naples, and Mediterranean powers	13
Holland	28	Britain	153

Or, a little more than one-half possessed by Great Britain. In 1844, Britain possessed nearly as many such ships as all the rest of the world together.

LINE OF BATTLE SHIPS, 1844.

France	45	Spain	3
Russia	50	Portugal	2
Egypt and Turkey	19	Denmark	6
America	10	Sweden	10
Naples	1	Britain	125
Holland	8		

ACCOUNT OF THE PROGRESSIVE INCREASE OF THE ROYAL NAVY, FROM HENRY VIII.'S REIGN TO THE CLOSE OF THE LAST WAR, 1814.

Year.	Ships.	Tons.	Men voted.	Navy estimates.
1521	16	7,260		No account.
1578	24	10,506	6,700	
1603	42	17,055	8,346	
1658	157	57,000	21,910	
1688	173	101,892	42,000	
1702	272	159,020	40,000	£1,056,915
1760	412	321,134	70,000	3,227,143
1793	493	433,226	45,000	5,525,331
1800	767	668,744	135,000	12,422,837
1808	369	892,800	143,800	17,496,047
1814	901	966,000	146,000	18,786,509

In 1814, Great Britain had 901 ships, of which 177 were of the line; and in 1830, 921 ships.

* We are indebted for these facts to the able work of P. L. Simmonds, Esq., of the Colonial Magazine of London.

BRITISH NAVY, 1816.

	At sea.	In port.	In commission.	In ordinary and repairing.	Building.	Guard ships.
Ships of the Line	12	11	29	130	18	2
From 50 to 44 guns	2	3	5	19	—	–
Frigates	32	7	40	88	9	1
Sloops, &c.	14	6	20	24	1	0
Brigs	46	17	63	117	5	0
Cutters	3	1	4	2	—	0
Schooners	3	4	7	5	—	0
Bombs	—	—	—	6	—	0
Hospital Ships, &c.	—	—	—	—	—	4
	112	49	168	391	33	7
Grand Total,				592		

The expenses of the navy for the year ending 5th July, 1843, were £6,557,201.

BRITISH NAVY, 1842.

	In Ordinary. No.		In Commission. No. ships.	Men.
First Class	16	First Rates	2	1,950
Second "	15	Second "	6	4,700
Third "	46	Third "	7	4,500
Fourth "	33	Fourth "	8	3,801
Fifth "	64	Fifth "	12	4,000
Sixth "	10	Sixth "	14	2,990
Sloops	8	Sloops	41	5,458
Brigs	15	Steam Vessels	66	3,666
Packets	11	Gunboats	39	1,602
Cutters	6	Packet Brigs	7	308
Steam Vessels	16	Surveying Vessels	14	1,014
		Yatchts	3	289
	240	Stationary Ships	14	5,368
			233	39,646

We shall now draw for the remainder of our paper upon official documents, presented in 1846, by Mr. Bancroft, to the Senate of the United States. They were prepared by a Board of Naval Officers, and embrace all the nations of the world.

NAVAL FORCE OF GREAT BRITAIN, 1846.

	In Commission.		Building.		In Ordinary.		Total.
	No.	Guns.	No.	Guns.	No.	Guns.	
Ships of the Line	17	1,570	23	2,124	75	6,258	115
Frigates	32	1,146	15	498	73	3,066	120
Sloops, brigs, and bombs	71	856	21	305	40	521	132
Schooners, cutters, tenders, and ketches	33	66	—	—	6	18	39
Steam Frigates	6	60	12	120	4	40	22
Steam Sloops	54	270	20	100	6	30	80
Steam Packets	21	42	3	6	—	—	24
Other Steamers	9	18	6	12	—	—	15
Transp'ts and troop ships	5	70	—	—	—	—	5
Receiving ships, coast guards, and other non-effective vessels, as coal depots, convict hulks, &c., employed in service connected with navy	84	435	—	—	—	—	84
Total,	332	4,583	100	3,165	204	9,933	636

The official list numbers 671 vessels, but names only 636; whole number of guns to 636 vessels, 17,681; number of men in the navy, 27,500; boys, 2,000; marines, 10,500—total, 40,000. Revenue vessels, 72, mounting 144 guns: British Indian navy, 1844–'5, 36 vessels, of which 22 are steamers—guns 166. Total number of steamers in the English navy, including 35 contract mail-steamers, 199. There are eight East India mail-steamers.

2.—UNITED STATES.

In 1780, a Committee of Congress reported but four American war-vessels fit for service. In 1781, we had but two frigates, the Alliance and the Deane; the former of which, being the sole American war-vessel remaining, was sold at the close of the war. The Algerine depredations upon our commerce in the Mediteranean, convinced Congress of the importance of providing a naval armament; and six frigates were authorized in 1794, and also ten vessels to be fitted as galleys. A navy, however, being very unpopular in Congress, and a treaty of peace being made with Algiers, but three of these frigates were completed. In the apprehension of French difficulties in 1798, the President was authorized to build, buy or hire twelve vessels, of not more than 22 guns each, and the naval charge was taken from the Secretary of War and given to an independent department. In 1801, a treaty being made with France, the President was authorized to sell all the naval vessels, except the frigates Constitution, United States, Congress, Constellation, President, Chesapeake, Essex, Philadelphia, New-York, Boston, John Adams, Adams and General Greene.

From this period, the growth of the navy has been steady, "fighting itself," as it has been said, "into favor," and into its present stature. We now proceed to furnish a few tabular statements.

UNITED STATES VESSELS, 1799.*

Frigates.	Guns.	Cost.	Ships.	Guns.	Cost.
United States	44	$299,336	Ganges	24	$80,640
Constitution	44	302,718	Portsmouth	24	59,561
President	44	220,910	Merrimack	24	46,170
Constellation	36	314,212	Connecticut	24	57,260
Congress	36	197,246	Baltimore	20	56,277
Chesapeake	36	220,677	Delaware	20	59,563
New-York	36	159,639	Maryland	20	70,249
Philadelphia	32	179,349	Patapsco	20	73,164
Essex	32	139,362	Herald	18	47,780
John Adams	32	113,505	Trumbull	20	58,494
Adams	32	76,622	Warren	20	34,702
Boston	32	119,590	Montezuma	20	55,732
General Greene	24	105,492			
Washington	24	69,024			
Insurgent	36	96,640			

BRIGS, Norfolk, 18 guns; Richard, 18; Augusta, 14; Pickering, 16; Syren, 16; Argus, 16; Hornet, 16.—SCHOONERS, Enterprize, 14; Experiment, 14; Vixen, 14; Nautilus, 14.—GALLEYS, South Carolina, Charleston, Beaufort, St. Mary's, Savannah, Protector, Mars, Governor Davie, Governor Williams.

* Seybert's Statistics of United States.

UNITED STATES NAVY, 1812.

	Guns.		Guns
Constitution	44	Siren	16
United States	44	Argus	16
President	44	Oneida	16
Chesapeake	36	Vixen	12
Constellation	36	Nautilus	12
Congress	36	Enterprize	12
Essex	32	Viper	12
New-York, Boston, unseaworthy	36, 32	Bomb Vessels: Etna, Vesuvius, Vengeance, and Spitfire.	
Adams	32		
John Adams	26		
Wasp	16		
Hornet	16	170 Gun-boats.	

UNITED STATES NAVY, 1815.

24 ships	916 guns	17 gallies	34 guns
16 brigs	236 "	51 barges	84 "
29 schooners	94 "	124 gun-boats	179 "
6 sloops	23 "	5 lighters	6 "
3 ketches	—	2 floating batteries	64 "
Total guns			1,636

AMERICAN NAVAL VICTORIES, 1812—1815.*

	Guns mounted.	Killed and Wounded.	Captured vessels.	Guns mounted.	Killed and wounded.
Essex	46	—	Alert	20	2
Constitution	54	14	Guerriere	49	76
Wasp	18	10	Frolic	22	75
United States	54	12	Macedonian	44	104
Constitution	54	34	Java	49	161
Hornet	20	5	Peacock	22	40
Enterprize	—	14	Boxer	18	—
Lawrence	20	83	Detroit	19	160
Niagara	20	27	Queen Charlotte	17	
Caledonia	3	3	Lady Provost,	13	
Ariel	4	4	Hunter	10	
Scorpion	2	2	Little Belt	3	
Somers	2	2	Chippewa	1	
Trippe	1	2			
Tigress	1	—			
Porcupine	1	—			
Peacock	20	2	Empervier	18	23
Wasp	20	26	Reindeer	19	67
Wasp	20	3	Avon	19	43
Saratoga	26	57	Confiance	39	260
Eagle	20	33	Linnet	16	
Ticonderoga	17	12	Chub	11	
Preble	7	2	Finch	11	
10 Galleys	16	6	13 Galleys	18	
Constitution	54	15	Levant and Cyane	56	120
Hornet	20	12	Penguin	20	42

During the war, the Americans lost the following vessels:

Nautilus, 16 guns, taken by Shannon frigate.
Wasp, taken by Poictiers, 74-gun-ship.
Vixen, 16 guns, taken by Southampton, 38 guns.
Chesapeake, 49 guns, taken by Shannon, 53 guns.
Argus, 20 guns, taken by Pelican, 22 guns.

* Seybert.

Essex, 46 guns, taken by Phoebe, 53, and Cherub, 28 guns.
President, 53 guns, by Majestic, and frigates Endymion, Pomone and Tenedos.
Rattlesnake, 14 guns, taken by Leander, 50 guns.
Frolic, 18 guns, taken by Orpheus frigate.
Viper, taken by Narcissus frigate.
Brig Siren, taken by Plantagenet, 74 guns.
Adams, 32 guns, destroyed to save from enemy.
Boston, 32 } New-York, 36 } Argus, 13 } Columbia, 44 } destroyed by order of Secretary of Navy, when the British were about entering Washington.

UNITED STATES NAVY, 1846.

	In Commission. No.	Guns.	Building. No.	Guns.	In Ordinary. No.	Guns.
Ships of the Line	4	374	5	420	2	164
Frigates and Razees	7	374	3	150	5	260
Sloops of War	15	314	2	40	6	120
Brigs of War	6	60	—	—	2	20
Steamers of War	3	23	1	4	3	12
Schooners	1	10	—	—	—	—
Small unarmed vessels and Store-ships	11	—	—	—	1	—
	47	1,155	11	614	19	576

Total number of government vessels, all classes, 77; total guns, when all armed, 2,345; number of seamen and boys employed in naval service, 7,500; marine corps, exclusive of officers, 1,224; total, 8,724.

The following list of the American navy is complete, and is the latest published. It will be seen, the whole number of vessels given is eighty-five.

UNITED STATES NAVY, 1848.

Ships of the Line—11.		Where built.		Commanders.	Where employed.
Pennsylvania	120.	Philadelphia	1837	*C. K. Stribbling	Rec'ing sp. Norfolk
Franklin	74.	Philadelphia	1815	*J. K. Crowninshield	do. Boston
Columbus	74.	Washington	1819	T. W. Wyman	Pacific Ocean
Ohio	74.	New-York	1820	S. K. Stringham	do.
North Carolina	74.	Philadelphia	1820	*W. C. Nicholson.	Rec'ing sh. N. York
Delaware	74.	Gosport, Va	1820	—	Norfolk
Alabama	74.	Portsmouth		—	Stocks, Portsmouth
Vermont	74.	Charlestown	1819	—	
Virginia	74.	Boston		—	do. Boston
New-York	74.	Norfolk		—	do. Norfolk
New-Orleans	74.	Sackett's Harbor		—	do. Sac. Harbor
Independence, *Razee*,	54.	Boston	1814	F. Lavellette	Pacific Ocean
Frigates, 1st Class, 12.					
United States	44.	Philadelphia	1797	J. Smoot	Mediterranean
Constitution	44.	Boston	1797	—	Boston
Potomac	44.	Washington	1821	—	Norfolk
Brandywine	44.	Do.	1825	T. Crabbe	Coast Brazil
Columbia	44.	Do.	1836	*R. Ritchie	do. do.
Congress	44.	Portsmouth	1841	Stockton	Pacific
Cumberland	44.	Boston	1842	Jameson	Home Squadron
Savannah	44.	New-York	1842	Mervin	Pacific
Raritan	44.	Philadelphia	1843	—	Norfolk
Santee	44.	Portsmouth		—	Stocks, Portsmouth
Sabine	44.	New-York		—	do. N. York
St. Lawrence	44.	Norfolk		—	do. Norfolk
Frigates, 2d Class—2.					
Constellation	36.	Baltimore	1797	—	Norfolk
Macedonian	36.	Captur'd 1812, rebuilt in 1836		—	New-York

* Commanders. † Lieutenants. All others are Captains.

Sloops of War—22.		Where built.		Commanders.	Where employed.
Saratoga	20.	Portsmouth	1842	*D. G. Faragut	Home Squadron
John Adams	20	Charleston, S. C. '99, rebuilt, 1820		Adams	do. do
Vincennes	20.	New-York	1826	——	New-York
Warren	20.	Boston	1826	*Hull	Pacific
Falmouth	20.	Do.	1827	——	Boston
Fairfield	20.	New-York	1828	——	Norfolk
Vandalia	20.	Philadelphia	1828	——	do.
St. Louis	20.	Washington	1828	——	do.
Cyane	20.	Boston	1837	*Du Pont	Pacific
Levant	20.	New-York	1837	Page	do.
Portsmouth	20.	Portsmouth	1843	*Montgomery	do.
Plymouth	20.	Boston	1844	——	New-York
St. Mary's	20.	Washington	1844	——	Norfolk
Jamestown	20.	Norfolk	1844	*Mercer	Africa
Albany	20.	New-York	1846	——	Home Squadron
Germantown	20.	Philadelphia	1846	*Buchanan	do. do.
Ontario	18.	Baltimore	1813	*Long	Rec'ing sh. Baltim.
Decatur	16.	New-York	1839	Pinckney	Home Squadron
Preble	16.	Portsmouth	1839	*Shields	Pacific
Yorktown	16.	Norfolk	1839	——	Boston
Marion	16.	Boston	1839	*Simonds	Mediterranean
Dale	16.	Philadelphia	1839	*Rudd	Pacific
Brigs—5.					
Boxer	10.	Boston	1831	†Bell	Coast Africa
Dolphin	10.	New-York	1836	*Pope	do. do.
Porpoise	10.	Boston	1836	†Gordon	Home Squadron
Bainbridge	10.	Do.	1842	†Williamson	Coast Brazil
Perry	10.	Norfolk	1843	*Barron	do. do.
Schooners—8.					
Experiment		Washington	1831	†Lardner	Rec'ing sh. Phila.
Flirt		Transferred from		†Palmer	Home Squadron
Wave		War Department.		——	Coast Survey
Phenix				——	do. do.
On-ka-hy-e		Purchased		†Berryman	Packet Service
Bonito	1.	Do.	1846	†Berrien	Home Squadron
Reefer	1.	Do.	1846	†Chauncey	do. do.
Petrel	1.	Do.	1846	†Moor	do. do,
Bomb Vessels—5.					
Ætna	1.	Purchased	1846	Van Brunt	Home Squadron
Stromboli	1.	Do.	1846	†Tucker	do. do.
Vesuvius	1.	Do.	1846	*Magruder	do. do.
Hecla	1.	Do.	1846	†Fairfax	do. do.
Electra	1.	Do.	1846	†Hunt	do. do.
Steamers—13.					
Mississippi	a10.	Philadelphia	1841	†Lee	Home Squadron
Fulton	4.	New-York	1837	——	New-York
Union	4.	Norfolk	1842	——	Washington
Princeton	9.	Philadelphia	1843	*Engle	Mediterranean
Michigan	1.	Erie, Pa	1844	*Champlin	Lakes
Alleghany		Pittsburg, Pa		†Hunter	Mediterranean
Spitfire	3.	Purchased	1846	†Porter	Home Squadron
Vixen	3.	Do.	1846	†Smith	do. do.
Scorpion		Do.	1846	*Bigelow	do. do.
Scourge		Do.	1846	†Lockwood	do. do.
General Taylor		Trans. fm War Dep.		——	Pensacola
Water Witch		Washington	1845	†Totten	Washington
Engineer		Purchased.		——	Norfolk
Store Ships and Brigs—6					
Relief	6.	Philadelphia	1836	†Bullus	Home Squadron
Erie	8.	Baltimore	1813	†Watson	Pacific
Lexington	8.	New-York	1825	†Bailey	do.
Southampton	6.	Norfolk	1845	†Thornburn	do.
Supply		Purchased	1846	†De Camp	Home Squadron
Fredonia		Do.	1846	†Turner	do. do.

* Commanders. † Lieutenants. All others are Captains. (a) Paixhan guns.

AMERICAN NAVY YARDS.

"The navy yards of the United States,* like those of Britain, are seven in number, viz. Portsmouth, in New-Hampshire; Charlestown, near Boston, Mass.; Brooklyn, New-York; Philadelphia; Washington; Gosport, in Virginia; Pensacola, Florida.† None of these, however, are so extensive, so well furnished and stored with the muniments of war, so efficiently kept up, or so conveniently situated on the sea-coast, as are our Portsmouth, Plymouth, Pembroke and Sheerness yards. The Americans have also commanders of naval yards located at Baltimore and Charleston, two leading ports, but there are no regular government establishments or conveniences for building and repairs in those harbors.

"PORTSMOUTH.—This dock-yard is situate at Navy Island, on the east side of the river Piscataqua, three miles from the ocean. There is every convenience for the construction of vessels of the largest class. The harbor of Portsmouth is a fine one, with forty feet of water in the channel at low tide, and is well protected by its islands and headlands from storms. The tide, which here rises ten feet, flows with so rapid a current as to keep the harbor free from ice.

"BOSTON.—The navy yard of this port is situated at the south-east part of Charlestown, about a mile to the north of the city of Boston. There is a dry-dock built of hewn granite. The yard covers sixty acres of land, on which are erected a marine hospital, a spacious ware-house, an arsenal, powder-magazine, and a house for the superintendent, all of brick; there are also two immense wooden sheds, under which the largest vessels of war are built.

"BROOKLYN.—The naval yard, situated on Wallabout Bay, covers forty acres of ground, enclosed by a brick wall on the land-side, and contains two large ship houses, seven extensive timber sheds, built of brick, and several workshops, offices for the officers, and extensive storehouses; a dry-dock is in the course of formation. The yard is but a short distance from the city of New-York, the width of the ferry is about 700 yards. The naval hospital occupies a commanding eminence half a mile east of the yard, and is a large building surrounded by thirty-three acres of cultivated ground, enclosed by a brick wall.

"PHILADELPHIA.—This naval yard requires no observation. We may, however, remark, that there is in that city, a handsome naval asylum or marine hospital, capable of lodging 400 persons, erected at a cost of upwards of $300,000.

"WASHINGTON.—The navy yard is situated on the Anacosta or eastern branch of the Potomac, 295 miles from the ocean by the course of the river and bay. It is about three-fourths of a mile south-east of the capital, and contains twenty-seven acres. It has houses for the officers, shops and warehouses, two large ship-houses, a neat armory, and every kind of naval stores. Several ships of

* We extract from Simmonds' Colonial Magazine.

† Also add Charleston, S. C., and Memphis, Tenn., where works, etc. exist.

war, some of which were of the largest class, have been built at this yard. The river has water of sufficient depth for frigates to ascend to the navy yard without being lightened.

"NORFOLK.—The extensive naval yard at this port is situated at Gosport, opposite to Norfolk, on the south side of the river Elizabeth, thirty-two miles from the ocean. This yard possesses a large and extensive dry-dock, constructed of hewn granite, capable of receiving a line-of-battle ship, and which cost nearly $1,000,000. The harbor is safe and capacious, having eighteen feet of water.

"PENSACOLA.—The United States navy yard here is an important one, distant eight miles from the city, and five from the entrance of the harbor, and covers nearly eighty acres of ground, enclosed by a high brick wall. It contains houses for the officers and a naval store, and other buildings adapted to the convenience of the establishment."

NAMING AMERICAN NAVAL VESSELS.

"There is a matter connected with the naming of American vessels, which may be incidentally adverted to, for the information of professional men: it is this:—A joint resolution of Congress, of 3d March, 1819, requires vessels of the first class to be called after the *States* of the Union; those of the second class after *rivers;* and those of the third class after the principal *cities* and *towns;* but no two vessels in the navy can bear the same name."

3.—THE FRENCH NAVY.

France had, as early as 1681, 60,000 seamen, and in 1791, 100,000, commanding 82 ships of the line and 73 frigates.

FRENCH NAVY, 1839.

Ships of the Line, first rates	5	
" second rates	1	
" third "	7	
" fourth "	9	—22
Frigates, first class	12	
" second class	12	
" third "	13	—37
Steamers, from 4 to 6 guns	25	—25

NAVAL FORCE OF FRANCE, 1845.

	In Commission. No.	Guns.	Building. No.	Guns.	In Ordinary. No.	Guns.	Total Ships.
Ships of the Line	17	1,598	25	2,442	4	340	46
Frigates	23	1,184	16	810	6	310	45
Corvettes	17	444	3	90	6	124	26
Brigs	34	464	2	40	21	270	57
Schooners, cutters, and small vessels	37	122	2	12	8	20	47
Transports, &c	33	132	10	40	14	56	59
Steam Frigates	5	78	2	12	—	—	7
Steam Corvettes	8	62	9	54	—	—	17
Smaller Steamers	41	209	3	15	—	—	44
Total	215	4,293	72	3,515	59	1,120	346

Total guns when all armed, 8,928; men and boys in service in 1845, 27,554. Cannon and powder for service, manufactured at government foundries, &c. The Minister of Marine proposed to increase the navy to the following maximum: 40 ships of the line; 20 to be always ready for sea, and 20 in construction; 50 frigates, of which 40 to be ready for sea, and 10 on stocks; 60 sloops, 60 brigs, and 40 lighter vessels, besides transports. The steam-navy to be composed of 100 vessels in all.

4.—NAVAL FORCE OF RUSSIA.

Nicholas has kept a constant eye upon his naval affairs, and has, within fifteen or twenty years, created two large fleets in the Baltic and on the Black Sea.

	Vessels.	Guns.	No. of guns in vessel.
Ships of the Line in Baltic	30	2,400	Estimated 80 guns each
Frigates in Baltic	20	840	" 42 "
Sloops, brigs, and gun-boats in Baltic	40	320	" 8 "
Steamers in Baltic	26	104	" 4 "
Ships of the Line in Black Sea	17	1,360	—
Frigates " "	10	510	5 of 60, and 5 of 42 guns
Sloops and brigs " "	12	168	estimated 14 guns each
Smaller vessels " "	18	158	—
Steamers " "	6	36	" 6 "
The Baltic Fleet has a compliment			35,000 men
The Black Sea " "			24,000 "
Total			59,000 "

Exclusive of the naval force in the Caspian Sea.

RECAPITULATION.

Relative naval power of each nation.	In commission. Ves's.	In commission. Guns.	Building, ordn'y, &c. Vessels.	Building, ordn'y, &c. Guns.	Total. Vessels.	Total. Guns.	No. of men.	No. of war steamers.
Great Britain	†332	4,583	304	13,098	‖636	17,681	40,000	141
France	215	4,293	131	4,635	346	8,928	27,554	68
Russia	179	5,896	—	—	¶179	5,896	59,000	32
Turkey	62	2,636	4	24	66	2 660	26,820	9
United States	47	1,155	30	1,190	**77	2,345	8,724	5
Egypt	35	1,448	3	312	38	1,760	—	1
Holland	48	302	86	1,344	134	1,646	—	4
Sweden	‡330	660	50	1,196	380	1,856	—	2
Denmark	§96	344	12	732	108	1,076		—
Austria*	74	686	—	—	74	686		—
Brazil	31	450	11	325	42	775	—	8
Sardinia	11	226	4	220	15	446	—	2
Spain	21	348	—	—	21	348		4
Two Sicilies*	17	338	—	—	17	338		—
Portugal	59							
Mexico	23	42	—	—	23	42		

* Although the whole naval force of these nations has been placed in the column of "in commission," it is probable that a portion of it is in "ordinary," but it is not known what portion. These nations have a few war steamers, but the number is not known.

† Of the 332 vessels in commission, 84 bear but a nominal armament, although, by the official navy list for January, 1846, they appear to be employed in important service—as receiving, coast-guard, and convict vessels, coal depôts, quarantine service, &c.

‡ 323 of this number are gun-boats.

§ 86 of this number are men-of-war cutters and gun-boats.

I.—COMMERCIAL MARINE, GREAT BRITAIN.

	Steam vessels.	Tonnage.	Other vessels.	Tonnage.	Crews.
United Kingdom	897	113,232	23,253	2,994,166	170,102
Isle of Guernsey, Jersey and Man	3	445	763	50,226	5,559
Total	900	113,677	24,016	3,044,392	175,691

VESSELS ENGAGED IN COASTING AND FOREIGN TRADE, G. B., 1844.

	Vessels.	Tonnage.	Crews.
INWARD—*Foreign Trade.*			
British and Irish vessels	19,687	3,647,463	195,728
Foreign vessels	9,608	1,402,138	76,091
Coasting Trade.			
Employed between G. B. and Ireland	10,147	1,349,273	—
Other coasting vessels	123,751	9,615,434	—
OUTWARD—*Foreign Trade.*			
British and Irish vessels	19,738	3,852,822	212,924
Foreign vessels	9,816	1,144,346	77,109
Coasting Trade.			
Employed between G. B. and Ireland	16,948	1,817,756	—
Other coasting vessels	128,294	9,877,105	—

The above list includes all the arrivals and departures within the year, including repeated voyages of the same vessels.

In 1838, McCulloch stated the whole number of vessels owned in the British Empire, including plantations :

	29,912 vessels
	2,420,759 tons
	147,357 men
In 1844, steam vessels in England	679 vessels
	75,047 tons
" steamers in Scotland	137 vessels
	20,666 tons
" Ireland	81 vessels
	17,519 tons
Guernsey, &c., and Colonies	91 vessels
	12,444 tons

FISHERIES, 1843.

Northern, or Greenland	16 ships	800 men
Spermaceti whale	68 "	2,176 "
Common oil	1 "	32 "
	85	3,008

Notes to Recapitulation on preceding page, continued.

	Vessels.	Guns.
‖ Exclusive of sailing vessels in the Indian navy	14	106
steamers in the Indian navy	22	60
contract mail steamers, under control of government	*a*26	..
revenue vessels	72	144
Total	134	310

(*a*) 1843.

¶ Exclusive of the Caspian fleet.

	No. of vessels.	Total tons.	No. of guns.	Officers and men.
** Exclusive of U. States revenue vessels, consisting of	13 sailing	1,443	61	769
	8 steam	3,110		

II.—UNITED STATES COMMERCIAL MARINE, 1845.

Estimated number commercial vessels	19,720
Tonnage	2,416,999
Men	118,600
Of these,—	
Registered and in foreign trade	1,095,172 tons
Enrolled coastwise	1,196,898 "
Licensed, under 20 tons	32,322 "
Enrolled in cod fishery	69,825 "
" mackerel fishery	21,413 "
" whale "	206 "
" cod, (under 20 tons)	7,163 "

Of the registered tonnage, 745 vessels are in the whale fishery, 237,000 tons and 18,625 men; steam-boat tonnage, United States, 316,019; tonnage of lakes, 82,933; 474 vessels, 75 being steam.

III.—FRENCH COMMERCIAL MARINE, 1844.

Number of vessels, (mean of two authorities)	13,782
Tonnage	839,603
of which, vessels employed in whale fishery	29
Tonnage	11,903
Crews	866

In 1840, the cod-fishery employed 458 vessels, of 54,583 tons; 9,897 men. In coast-fishery, also, 5,849 boats, 40,610 tons, 25,000 fishermen; private steamers in 1844, 225.

RECAPITULATION.

Nations in the order of their commercial importance.	No. of vessels in commerce and fisheries.	Tonnage.	No. of guns to each 100,000 tons of commerce.
United Kingdom of Great Britain	23,898	3,007,581	583
United States	19,666	2,416,999	97
France	13,782	839,603	1,063
Sweden and Norway	5,450	471,772	224
Holland	1,528	241,676	683
Russia	Not known	239,000	2,466
Two Sicilies	9,174	213,198	158
Austria	6,199	203,551	321
Turkey	2,220	182,000	1,461
Sardinia	3,502	167,360	265
Denmark	3,036	153,408	709
Portugal	798	80,525	
Spain	2,700	80,000	
Brazil	Unknown	Unknown	
Mexico	Unknown	Unknown	

ART. VII.—THE SUGAR-CANE.

AVEQUIN'S REVIEW OF M'CULLOH, REVIEWED.

To Prof. J. D. B. De Bow:

Sir,—The number of your Review for July, 1848, contains an article, or letter, entitled "M'Culloh's Report on Sugar, reviewed," written by Mr. Avequin of your city, in a spirit of entire condemnation. He asserts, (page 25,) that "this Report is undeserving any eulogy;" that "the scientific or chemical part is radically and insufferably bad," and that "you will look in vain for a single paragraph in the chemical part of the report, which does not present an open flank for the attack of the critic;" for the truth of which declaration, he "appeals to all persons who have the slightest knowledge of chemistry." He strangely affirms, in the outset, that "the opinions which he is about to express are *entirely disinterested*," and at the conclusion of his article, after having entertained the reader with a long account of his own experiments, methods, and ideas, remarks that he "has limited himself to showing you some of the errors in the first chapter, only the most striking," and that "the facts exposed in his letter are *due to his own researches* on the sugar-cane." Certainly, therefore, he must be, as he professes himself, a most "*disinterested*" judge!

He tells you that, "in his excellent remarks, Mr. V. Aime has shown you that the purely practical part of this work contains nothing new; that it is of little value; that, on the contrary, it contains a great many errors, and has proved it to you." And yet Mr. Valcour Aime, who seems to have far more reason to consider himself unjustly treated by me than Mr. Avequin possibly can have, in the "excellent remarks" to which the latter refers, says of my report: "It is, in my opinion, one of the best documents which has ever been written on the subject. It makes known and describes generally, with great accuracy, *all the latest and best improvements* which have been made throughout the world in the sugar industry, and embodies an amount of *useful information*, which our sugar-planters could not otherwise obtain without perusing a great many volumes." Mr. Avequin says of Mr. V. Aime, that he is a "planter" and an "able refiner" of "long experience" and "practical knowledge;" his opinion of my work must, therefore, be admitted to be somewhat entitled to public confidence. The reader can refer, for that opinion in full, to Mr. V. Aime's own article in the March number of your Review for the present year; the preceding extract is sufficient to let him see how correctly it is understood and represented by the "*disinterested*" critic of my report. To Mr. V. Aime's criticisms I will reply at the end of this article, when I have done with "the attack" of Mr. Avequin upon me.

I shall pass over much of that attack in silence; for the reason that in the midst of unremitting labors I have but little time and less

inclination to attend to, or trouble your readers with, matters which I deem unimportant; and I shall proceed at once to meet those charges which Mr. Avequin makes against me last in order of position, but first in importance in *his* estimation, because they "are due to *his own* researches on the sugar-cane;" and which, therefore, have been prompted by a very "disinterested" desire to "show that this work is not without faults, and even great ones; that it does not deserve all the praise which has been lavished upon it; that it contains on the contrary numerous errors,—errors which are not pardonable in a professor of chemistry."

On page 44, Mr. Avequin says:

"I have spoken above of quotations mutilated or disfigured by the professor. I will give you a specimen in which I am directly concerned, where he speaks of cerosie."

"In paragraph 1st, page 22d of his report, the professor says: 'Cerosie is a substance closely resembling beeswax, both in its appearance and its properties. It was discovered or first investigated by Mr. Avequin, of New-Orleans, who gave it the above name. A more full account of it, taken from Mr. Avequin's description and analyses, is given in the treatises on Chemistry, both of Liebig and Dumas,* to which I therefore refer. The planter may, however, for all his purposes, regard it as wax.'"

"Professor M'Culloh gives here the description of a substance which he does not know, which he has never seen, and the properties of which he disfigures. The cerosie does not resemble, in any respect, beeswax. Cerosie may be considered as an alcohol, unique in its kind, since it is the only one which is found completely formed and in a state of purity in nature."

"Its atomic formula is represented by $C^{24}\ H^{50}\ O = 24\ (C\ H^2) + H^2\ O$."

"Judge, then, of the exactness of the professor:"

"Ab uno disce omnes."—VIRGIL.

"The professor would not believe that cerosie is an alcohol or an aldehyde, these substances have so little resemblance to each other."

In my report, the note at the bottom of the page corresponding to the asterisk gives as references: "Dumas, Traité de Chim., vol. vi. p. 699; Paris, 1843. Also Liebig's Chim. Organique, vol. ii. p. 304; Paris, 1844." But, in Mr. Avequin's article, he has seen fit to add a third reference: "Gerhardt, Précis de Chimie Organique, tome i. page 134; Paris, 1844." I adopt his reference and hold him bound by the implied admission that this treatise of M. Gerhardt is good authority. I also accept the issue: "*ab uno disce omnes*," as the criterion by which my "exactness" shall be "judged."

This general accusation of "quotations mutilated and disfigured," is a grave charge—one which, if true, should injure me as a "faithful" and "conscientious" narrator of matters of fact "without deception," and prove me destitute of those "high qualities" which Mr. Avequin says he is "willing to admit with Mr. V. Aime, and does not deny." I will, therefore, lay before your readers the authentic chemical history of this substance, of which it is said that I "disfigure the properties," and that it "does not resemble in *any* respect beeswax." It may be found somewhat tedious, but I give it in full:

In the *Journal de Pharmacie*, vol. xxvi., page 738; Paris, 1840,

there is an article written by "M. Avequin, Pharmacien à la Nouvelle-Orléans," and entitled "*Note sur la Cire Végétale de la Canne à Sucre*," which I here transcribe, and request you to publish in its original language, (as I do in relation to all similar extracts,) that no mistake may occur by translation, and that Mr. Avequin may be judged by *his own* words:

"*Note sur la Cire Végétale de la Canne à Sucre.*"

"Par M. AVEQUIN, pharmacien à la Nouvelle-Orléans."

"Un grand nombre de plantes laissent exsuder sur leurs feuilles ou sur leurs fruits une substance à laquelle on a donné le nom de cire végétale. Tingry, de Genève, est le premier chimiste qui se soit occupé de cette matière. Proust avait depuis étendu la découverte de Tingry à un grand nombre de fruits, tels que les prunes, les cerises, les raisins, etc., et à presque toutes les feuilles, spécialement aux feuilles glauques. Les choux, les iris, plusieurs graminées, les roseaux en donnent aussi; les giraumons récoltés entre les tropiques en présentent une couche épaisse; mais aucune plante n'en fournit autant que la canne à sucre. Cette substance n'est pas identique sur tous les végétaux qui en produisent; on pourrait même affirmer qu'elle diffère toujours par quelques nuances dans ses propriétés physiques et chimiques, et que chaque végétal produit une substance cireuse qui lui est propre."

"*Cire de la canne à sucre.*"

"Il existe sur la canne à sucre une substance qui a quelques analogies avec la cire du myrica, et qui n'a jamais été examinée, du moins que je sache. Je l'avais signalée dans l'*Analyse comparative de la canne à rubans et de la canne d'Otahiti*, mais sans en avoir étudié les propriétés, parce qu'à cette époque je n'avais pas pu m'en procurer une assez grande quantité. Bien que je lui donne le nom de cire, il serait peut-être plus convenable de lui en assigner un autre, car elle s'éloigne beaucoup des propriétés de la cire."

"Cette substance se trouve en plus grande abondance à la surface de l'écorce de la canne violette que sur toutes les autres variétés de cannes; la partie engaînante des feuilles en est aussi recouverte. Elle se présente sous forme de poussière blanche ou glauque, adhérente à l'écorce, et elle peut facilement en être détachée en la grattant avec la lame d'un couteau, ou tout autre instrument tranchant. Vient ensuite la canne à rubans qui en fournit beaucoup. La canne d'Otahiti en contient à peine le tiers de la canne à rubans, et la canne créole n'en donne presque pas. Sur cette dernière variété, il n'y en a qu'un anneau à la base de chaque nœud et en bien petite quantité. A cet égard, je ferai observer que c'est la plus mauvaise variété de canne qui fournit le plus de cire. La canne violette est très-dure, très-ligneuse, contient peu de jus et donne peu de sucre; cependant le sucre que l'on en obtient est ferme et de bonne qualité."

"Après m'être procuré une certaine quantité de cire brute, par le grattage, comme il vient d'être dit plus haut, pour l'amener à l'état de pureté, je la fais macérer à froid dans de l'alcool à 35 ou 36 degrés, pour la débarrasser de la matière violette, matière identique à la chlorophylle avec laquelle elle est mélangée. Quand elle a subi ce traitement à plusieurs reprises et que l'alcool froid ne lui enlève plus rien, je la traite par l'alcool à 36 degrés bouillant, qui la dissout complétement; je passe à travers une toile de lin serrée, en exprimant fortement, et je retire l'alcool par la distillation; il ne reste plus qu'à la faire fondre au bain-marie pour l'avoir pure."

"*Propriétés physiques et chimiques.*"

"Cette matière est insoluble dans l'eau."

"Elle est également insoluble dans l'alcool à 36 degrés à froid."

"Elle est entièrement soluble dans l'alcool bouillant et ne s'en sépare point par le refroidissement. Elle se prend au contraire en masse opaline et ressemble à une solution alcoolique de savon animal. Plus l'alcool est fort, et mieux elle s'y dissout à chaud. Quatre grains de cette substance suffisent pour solidifier une once d'alcool à 36 degrés et lui donner la consistance et l'apparence de l'opodeldoch. On pourrait même s'y méprendre à la vue."

"Elle est insoluble dans l'éther sulfurique à froid."

"Elle s'y dissout difficilement à chaud et en petite quantité ; par le refroidissement l'éther la laisse déposer sous forme de petits cristaux grenus."

"Cette substance a une teinte jaunâtre un peu terne."

"Elle est excessivement dure ; la cassure est nette et l'on peut facilement la réduire en poudre en la triturant dans un mortier de marbre ou de verre ; elle est alors d'une grande blancheur."

"Réduite sous forme de bougie, elle brûle avec une belle flamme blanche, comme la cire ou le spermaceti. Sous ce rapport, elle peut servir à faire des bougies de luxe et qui ne le cèdent en rien à ces deux substances par l'éclat de la flamme et par sa durée."

"Elle fond à 82 degrés centigrades, à 80 degrés elle se solidifie. C'est, je crois, la substance de ce genre dont le point de fusion est le plus éleve."

"Fondue au bain-marie, et coulée en petite masse dans un vase froid et bon conducteur du calorique, elle se prend à l'instant même, se crispe en touchant le corps froid, et la surface inférieure présente une foule d'accidents et de guillochures très-agrèables à l'œil. Ces accidents sont déterminés par le retrait subit que cette matière prend en se figeant."

"Son poids spécifique est égal à 961 à la température de 10 degrés. Elle est sans odeur, ou presque sans odeur définissable. Elle se combine très-difficilement avec les alcalis."

"L'air atmosphérique n'a aucune action sur elle ; j'ai conservé de la cire de canne pendant plusieurs années dans un flacon mal bouché, sans qu'il en soit résulté aucun changement dans ses propriétés physiques."

"Cette substance est susceptible d'affecter une forme cristalline. Pour l'obtenir sous cet état, on la fait fondre dans une capsule de porcelaine, au bain-marie, et on la laisse refroidir très-lentement. Lorsque sa surface est solidifiée, on la perce au moyen d'une lame de couteau chauffée et on fait couler la portion encore liquide. L'intérieur de la capsule présente alors une foule d'aiguilles cristallines tronquées et entrelacées, bien apparentes. Je dirai cependant que cette cristallisation ne peut s'obtenir qu'en agissant sur une livre de matière au moins ; sur une plus petite quantité le résultat n'est pas aussi satisfaisant, bien qu'il soit très-sensible."

"Cette substance est de même nature sur toutes les variétés de cannes à sucre "

"153 cannes violettes grattées avec soin et sans enlever l'épiderme, m'ont donné 170 grammes de cire. Cette matière a été pesée deux mois après son extraction. J'estime que je n'en ai pas extrait plus de la moitié par ce moyen mécanique, et qu'il en est bien resté une égale quantité sur les cannes."

"Je l'ai fait macérer à froid dans de l'alcool à 35 degrès."

"Elle a subi ce traitement jusqu'à ce que l'alcool sortit presque sans couleur. Après ces divers traitements, elle pesait 154 grammes. Elle a été traitée alors par l'alcool bouillant pour la purifier."

"Le procédé par le grattage serait très-long, et peu économique ; j'ai

employé un autre moyen plus expéditif, et qui permet de l'obtenir plus facilement."

"En passant les cannes au moulin, pour en extraire le jus, une portion de cette matière se détache par la pression; elle est entraînée par le jus de canne et vient nager à la surface des bacs sous forme de poudre blanche. On prend ce jus de cannes, on le porte à l'ébullition à une chaleur douce, sans y ajouter de chaux; on recueille soigneusement toutes les écumes, lorsqu'elles sont bien formées; on les lave et on les fait macérer dans de l'alcool faible pour enlever toute la partie sucrée et pour détruire la viscosité qui s'oppose au lavage à l'eau. On les met égoutter sur une toile et on les fait sécher. Amenées à cet état, on les réduit en poudre, on les traite par l'alcool à 36 degrés à froid; on renouvelle l'alcool à plusieurs reprises, ou jusqu'à ce qu'il ne prenne plus de teinte verte. Alors on jette le tout sur un filtre et on le fait sécher. On prend ce résidu qui contient la cire, on le traite par l'alcool à 36 degrés bouillant, on passe à travers une toile de lin serrée et on exprime fortement. L'alcool en se refroidissant se prend en masse comme s'il contenait une solution de savon animal. On réitère ce traitement par de nouvel alcool bouillant, jusqu'à ce qu'il n'enlève plus de cire."

"On en sépare l'alcool par la distillation au bain-marie: mais par ce moyen la cire a toujours une teinte verte. Cette matière retient une portion de chlorophylle avec tant de force que l'alcool à froid ne peut tout débarrasser entièrement. C'est au moment de sa fusion à la surface du jus de cannes bouillant, qu'elle s'est combinée avec la chlorophylle provenant des débris d'écorce de la canne."

"En passant les cannes au moulin, toute la cire ne se détache pas, il en reste une grande partie sur les bagasses. 30 litres de jus de de cannes à rubans m'ont donné 22,50 grammes de cire d'une belle couleur verte. Par ce dernier moyen, cette cire n'est pas pure, elle se trouve mélangée de chlorophylle."

"La matière verte ou chlorophylle, dissoute par la cire de canne, ne conserve pas très-longtemps sa belle couleur verte. Après quelques mois, sa belle teinte verte commence à s'affaiblir, et après plusieurs années elle n'a plus qu'une couleur jaune verdâtre."

"J'ai retiré plus de 2 grammes de cire d'une canne violette."

"Un arpent de cannes donne de 18 à 20,000 cannes, par conséquent 18,000 cannes donneraient 36 kilogrammes de cire."

"Un planteur qui *roule* par an 300 arpents de cannes, pourrait faire plus de 10,000 kilogrammes de cire."

"Cette substance offre de l'intérêt sous plusieurs points de vue:

1º Son haut point de fusion;

2º Sa consistance, qui la rapproche de la dureté du bois;

3º Sa cristallisation;

4º Son application à l'éclairage, comme bougie de luxe;

5º Sa propriété de solidifier l'alcool, propriété qu'aucune substance de ce genre ne partage avec elle."

The preceding article of Mr. Avequin, with some modifications chiefly of style and language, was also published about the same time in the *Annales de Chimie et de Physique*, t. 75, p. 218; from which version of it, I make the following extract:

"Je donne le nom de *Cérosie* à cette substance (de Κηρος, cire,) ce qui rapellera sa composition et quelques-unes de ses propriétés les plus importantes."

In the same volume, and immediately succeeding the article of

Mr. Avequin (see page 222,) there is a communication from M. Dumas, entitled: "*Note sur la Composition de la Cérosie*," which gives the following results of three analyses:

Carbon,	81·4	81·2	81·0
Hydrogen,	14·2	14·2	14·0
Oxygen,	4·4	4·6	5·0
	100·0	100·0	100·0

Of which results M. Dumas says:

"L'ensemble de ces analyses conduit à une formule fort remarquable, qu'on regrette, faute de matière, de ne pouvoir controler par les recherches qu'elle indique. C'est la formule C^{96}, H^{96}, H^4, O^2, ou mieux, C^{96}, H^{100}, O^2, qui donnerait en effet

C^{96}	3600	81.4
H^{100}	625	14·1
O^2	200	5·5
	4425	100·0

"En représentant la cérosie par C^{96}, H^{96}, H^4, O^2, on en ferait un alcool, qui prendrait place après l'éthal, substance dont la cérosie se rapproche beaucoup en tout cas."

To explain to the reader the difference between the formula for *cerosie* of M. Dumas and that of M. Gerhardt, which Mr. Avequin adopts, it is only necessary to remark, that this difference is one only of theory and notation; and hat, according to the peculiar views of M. Dumas, the equivalent of carbon which chemists generally regard as single, is a double atom, while M. Gerhardt regards as single atoms those which others assume to be double: so that C^4, H^2, O^2, of M. Dumas, are respectively, C^2, H^2, O^2, of Liebig and others, and C, H, O, of M. Gerhardt.

Now let the reader decide whether I have "disfigured the properties" of this substance, which Mr. Avequin has himself called the *wax of the cane* ("cire de la canne à sucre;") which he says is of a dull yellowish color ("a une teinte jaunâtre un peu terne") and that it has some analogy to myrtle wax ("a quelques analogies avec la cire du myrica;") which he considered interesting because it may be manufactured into candles, which burn with a beautiful white flame like wax or spermaceti, ("réduite sous forme de bougie, elle brûle avec une belle flamme blanche, comme la cire ou le spermacéti;") of which wax he tells us, that a planter, who rolls annually 300 arpents of canes, might make more than 10,000 kilogrammes ("pourrait faire plus de 10,000 kilogrammes de cire;") and to which he gave the name of *cerosie*, derived from the Greek word for wax, as indicative of its composition and some of its most important properties, ("ce qui rapellera sa composition et quelques-unes de ses propriétés les plus importantes.")

But while he compares it to myrtle-wax, I have said that it "resembles bees-wax." Everybody is familiar with bees-wax, and therefore I compared *cerosie* to it, "both in appearance and properties;" that those possessing only "a general knowledge of chemistry," might form some notion of a substance which few know or

care much about, because they are not "directly concerned," as Mr. Avequin avows himself to be. That any one desiring a more full account of it might know where to look, I gave references, by page and volume, to the standard treatises of Liebig and Dumas. What more could a reasonable man expect in a brief report which was not designed to be a complete treatise on Organic Chemistry, and in which I might, with all propriety, have omitted any descriptive notice whatever of this substance, as I have done of many others which are much more important and more frequently mentioned in it? Had I compared it to myrtle-wax, as Mr. Avequin has done, many would probably have only conjectured that myrtle-wax must be something not unlike common bees-wax; and that, therefore, cerosie must be analogous to the latter. The following account of myrtle-wax is translated from the fifth volume of the treatise on Chemistry of Berzelius, a work admitted by all chemists to be of the highest authority:

"Myrtle wax (*cire du myrica*) is greenish; but when boiled in water it becomes partially discolored, and by exposure to the sun is entirely bleached. When cold it is harder than bees-wax, and may be pulverized. When heated, it hardens with less readiness than ordinary wax; and it melts at 43°. Its specific gravity is 1.015. Treated with 20 parts of boiling alcohol, it is decomposed, and yields 87 per cent. of *cerine*, which dissolves, and 13 per cent. of *myricine*, which remains. The saturated solution of cerine in alcohol deposits on cooling a quantity of cerine, which renders it gelatinous. It is slightly soluble in cold ether, but dissolves completely in four parts of boiling ether; upon cooling, the greater part of the wax is deposited. Oil of turpentine, when cold, softens it; but dissolves when boiling 1-17 of its weight. Also the acids and alkalies act upon it as they do upon common wax. The different varieties of wax which are obtained directly from the vegetable kingdom, are usually more brittle and fusible than bees-wax; and when used for the manufacture of candles, they give less light than bleached wax, and require the addition of tallow to render them less brittle."

Without going into details, the reader may be told that bees-wax is also composed of *cerine* and *myricine*, though in different proportions, and that the chemical properties of these two varieties of wax are not less alike than their physical. How just, therefore, must Mr. Avequin be in his censure of me for comparing cerosie to one of these waxes, when he himself compares it to the other?

"Strange! Such difference there should be
'Twixt tweedle-dum and tweedle-dee."

Mr. Avequin tells you (page 44) that "cerosie does not resemble in any respect bees-wax;" that it "may be considered as an alcohol unique in its kind," and therefore bids you judge of my "exactness," while he affirms that I "would not believe that cerosie is an alcohol or an aldehyde, these substances have so little resemblance to each other." Whatever I may or may not believe, I am not yet, and I hope I never shall become, so absorbed in speculative chemistry, and destitute of ordinary sense, as to compare to alcohol or aldehyde a wax-like substance, which Mr. Avequin has himself called wax, ("*cire*") and recommended for the manufacture of candles, when the object I have in view is merely to give some idea of its appearance and properties to practical men.

But I am willing to admit that cerosie may be, as Mr. Avequin contends, an alcohol or an aldehyde, and equally willing to believe it to belong to either, or neither, of these theoretical classes, when its composition and formula shall have been rigidly established. On this point I take his own reference, (Gerhardt, Precis de Chim. Organique, tome i. page 134; Paris, 1844), where we find for cerosie the formula 24 ($C H^2$) + $H^2 O$, adopted by Mr. Avequin, and the statement: "Des cinq alcools que nous venons de nommer, un seul se rencontre dans la nature, c'est la cerosie, *matiere cireuse* particulière que M. Avequin a extrâite de la canne à sucre." All this seems very straight, but if Mr. Avequin will refer to page 417 of the second volume of the same treatise, he will find the words: "*Cerosie normale*—$C^{24} H^{48} O$ (Lewy.) En râclant la surface de l'écorce des cannes à sucre, et particulièrement la variété violette, on obtient *une substance cireuse* que M. Avequin a appelée *cerosie*." And the note at the bottom of the page says: "Dans le premier volume, p. 134, nous avons classé la cérosie parmi les alcools; mais les analyses récentes de M. Lewy démontrent que ce corps ne présente pas une semblable composition." Now which of these two different views of the nature of *cerosie* is correct, that based upon an analysis of M. Dumas, and the corresponding formula 24 ($C H^2$) + $H^2 O$, which makes it an *alcohol*, or that which classifies it among the *aldehydes*, according to an analysis of M. Lewy, which differs from that of M. Dumas, and gives for its formula, $C^{24} H^{48} O$, or two atoms less of hydrogen? As our knowledge of the composition of this substance is based upon discordant analyses made by two different chemists, what degree of certainty can be claimed for it? Which of the two is right, and may they not both be wrong? Does not this subject belong to the "Chemistry of Probabilities," until some third person shall have investigated it thoroughly?

Let us look a little more closely into the matter. M. Dumas assumes, in order to establish his formula, the composition

Carbon	81·4
Hydrogen	14·1
Oxygen	4·5
	100·0

which is not that of either one of his analyses, nor yet the mean of the three; it is, therefore, a *hypothetical* and *approximate* basis, attended only with more or less of *probability*, and of which he expresses the regret that he could not investigate the subject fully, for want of a sufficient quantity of the substance, ("une formule forte remarquable qu'on regrette, faute de matière, de ne pouvoir controler par les recherches qu'elle indique.") Again, M. Gerhardt (vol. 2, p. 417,) after giving us the formula of Lewy for cerosie, $C^{24} H^{48} O$, which makes it an aldehyde, informs us that, "en traitant la cérosie par de la chaux potassée, M. Lewy a obtenu un acide blanc;" and of this acid, that "M. Lewy le représente par $C^{48} H^{96} O^3$, *mais*

cette composition ne me parait pas exacte ; l'auteur n'avait, du reste, pas assez de matiere pour approfondir ce sujet." In the original memoir of M. Lewy (see Comptes Rendus, t. xx. page 41) he says: "Je regrette beaucoup de n'avoir pas pu pousser plus loin mes expériences sur la cérosie, substance qui, à tout égard, aurait mérité une étude plus approfondie ; mais la petite quantité de matière m'a forcé de les interrompre."

Hence it appears that both of these chemists were unable to establish the nature of cerosie beyond all question, because neither of them had a sufficient quantity of the substance to make the requisite investigations.

On page 36 of my report I have said:

"A portion of the still moist feculencies being then carefully weighed, was thoroughly washed with alcohol of the strength of 95 per cent., and the mixture subjected to filtration on a counterpoised filter. The solid matter in the filter was gently and freely washed with fresh alcohol, after which it formed a perfectly dry pulverulent mass, and was equal in quantity to 11·04 per cent. of the original matter treated with alcohol. By evaporation this alcohol yielded 1·64 parts of *cerosie*, and a small portion of an essential oil; it had therefore taken up 87·32 parts of water. Hence the scum examined is composed of 87·32 per cent. of water, and 12·68 per cent. of dry matter."

Concerning this passage, Mr. Avequin remarks (p. 37): "Cerosie being entirely insoluble in alcohol, the professor has mistaken chlorophylle for cerosie!!!" It is true that cerosie is insoluble in alcohol, if the alcohol be cold; but according to Mr. Avequin's own statement, "elle est entièrement soluble dans l'alcool bouillant et ne s'en sépare point par le refroidissement. Plus l'alcool est fort, et mieux elle s'y dissout à chaud." This statement has been endorsed by M. Dumas (Ann. de Ch. et de Phys. t. 75, p. 222;) and I can also claim to know that it is true, for a specimen of cerosie, presented to me by Dr. Hort, Assayer of the New-Orleans Mint, and for another specimen in my possession—notwithstanding Mr. Avequin has asserted that I "described a substance which I do not know and have never seen." The account I have given of the analysis is brief, and it was not intended to furnish the details; of this the reader may be convinced, if he will turn to that part of my report; for he will find that I say *nothing* of the manner in which I determined the proportion of either the woody fibre, the albumen, the silica, the phosphate of lime, or the oxide of iron, all of which are enumerated as constituents of the dry matter. To a chemist, more minute statements would be unnecessary, to the practical reader, useless. And the reason why I mentioned the "washing with alcohol," is because I thus succeeded in drying a substance which could not have been freed from moisture in more usual ways; and not because I also separated the cerosie by using *hot* alcohol. Of the temperature of the alcohol I said nothing; Mr. Avequin, therefore, *assumed* that it was not heated; an assumption for which he alone is responsible, and upon which he bases his assertion that I mistook chlorophylle for cerosie—a charitable explanation of what would rather have been wilful falsehood on my part, if his assumption were true, than such a mistake as he suggests. For the infor-

mation of the general reader, I will state that, because most bodies are more soluble in hot than in cold liquids, chemists usually heat the liquid which they employ for washing a precipitate, or other substance, when they desire to separate a soluble ingredient. Mr. Avequin was, therefore, not at liberty to assume that the alcohol used by me was cold, unless he be ignorant of the art of chemical analysis.

It is also a common practice with chemists to keep a detailed record of experimental operations; and from such a journal the first chapter of my report is but a digested compilation. I do not, therefore, depend upon memory alone, when I state that I used *hot* alcohol for washing the feculencies. The following is a copy of the original entry:

"Weighed out one ounce of feculencies (specimen No. 31;) digested in boiling alcohol, 0·95; washed on a counterpoised filter; dried in a capsule, weighing ..... 1·4480 oz.

Capsule and dry contents	1·5584
Dry pulverulent residue	0·1104
Matter dissolved	0·8896
	1·0000
Evaporated the alcohol in a capsule, which weighed	1·4481 oz.
Capsule and cerosie	1·4645
Cerosie, etc	0·0164
	0·8896
Water	0·8732"

I admit that I was "inexact" when I said of cerosie, "a more full account of it, taken from *Mr. Avequin's* description and *analyses*, is given in the treatises on chemistry, both of Liebig and Dumas,"—for those analyses which I ascribed to Mr. Avequin were made by M. Dumas; and it does not appear that Mr. Avequin ever analyzed, or attempted to analyze, cerosie. Can this be the "specimen of mutilation and disfigurement of quotations" in which he is "directly concerned," and in relation to which, Mr. Avequin "exposes facts due to *his own* researches?" Or, when he tells you that:—"Cerosie may be considered as an alcohol, unique in its kind, since it is the only one which is found completely formed, and in a state of purity in nature. Its atomic formula is represented by C^{24} H^{50} $O = 24\ (C\ H^2) + H^2\ O$," and afterwards adds, "the facts that I have exposed in my letter, are *due to my own researches* on the sugar-cane; I *borrow nothing from those who have written on this subject*"—does he merely intend to say that *he adopts* M. Dumas' analyses and theoretical view of the chemical nature of cerosie? And when he also asserts, that I "would not believe that cerosie is an alcohol or an aldehyde, these substances have so little resemblance to each other," and that I have "described a substance which I do not know, which I have never seen, and the properties of which I disfigure," does he simply mean that, when I said "cerosie is a substance closely resembling bees-wax both in its appearance and its

properties," I failed to write a chapter on the theoretical views of modern chemists in regard to the classification of organic bodies generally, and Mr. Avequin's *cerosie* in particular; and that I had so little respect for the dignity and importance of this distinguished member of an alcohol or an aldehyde family, as to compare it to such an ignoble substance as bees-wax? After which it was, nevertheless, named by himself, before it aspired to belong to a more aristocratic family than that of the Waxes; and for the assigned reason, that its wax-derived name will recall its composition and some of its most important properties ("ce qui rapellera sa composition et quelques-unes de ses propriétés les plus importantes.")

Perhaps, however, when Mr. Avequin charges me with "quotations mutilated or disfigured," he did not intend that I should be permitted to cite his own original description of this "*Cire de la Canne a sucre*" in the *Journal de Pharmacie*, and that I should confine myself to my own references, or that "more full account taken from Mr. Avequin's description and analyses given in the treatises on Chemistry, both of Liebig and Dumas." If so, the reader will observe that I only referred to that account, and *did not quote* it. And if he will turn to the treatises, as indicated, he will find that Liebig ascribes its analyses to Dumas, and speaks of cerosie as "*une matière cireuse*," which he classifies among "*matières cireuses diverses;* while M. Dumas has only abridged the description of Mr. Avequin and his own account of its analysis, but omitted to mention a second time of the formula which would make cerosie an alcohol, that it is "une formule forte rémarquable, qu'on regrette, faute de matière, de ne pouvoir controler par les recherches qu'elle indique."

I have now done with this "specimen" of "quotations mutilated or disfigured," with the issue "*Ab uno disce omnes*," by which my "exactness is to be judged," and with Mr. Avequin's *cerosie;* of the alcoholic nature of which he and others may enjoy their speculations, while "the planter may, for all his purposes, regard it as wax."

It was not, however, what I said, or would not believe, of cerosie, which has offended Mr. Avequin. It was that I *did not adopt or even mention his views and researches* with reference to the "saline matters," etc., in cane juice and molasses; those "researches" to which his "exposition of facts was due;" which prompted him to express his entirely "disinterested opinion" of my work; and to an account of which he devotes a large portion of his letter addressed to you.

Of his "researches," on page 40, Mr. Avequin very modestly says:

"The facts which I have placed before you have not yet been understood by all the planters. When they do understand them perfectly, the state, or rather the planters in a body, can offer a reward of $100,000 to the person who will devise means for the total removal of these matters, previous to the crystallization of sugar; then, and then only, will there be no molasses."

"It will be not only one of the most magnificent discoveries made in chemistry, but one of the most useful; the services rendered to the planters would be incalculable, and could not be too highly recompensed."

Would it not be better to pay 100,000 to Mr. Avequin at once, and not put him to the great trouble of making new "researches" to establish his theoretical views? Certainly there can be no doubt of the correctness of those views, for although "the American chemist" did not mention them, M. Péligot,—"the French chemist, entrusted in 1842 with a similar work," and who is endorsed by Mr. Avequin as "a man of distinction in his profession," and as one who also "gave undeniable proof of his extensive knowledge of chemistry,"—does in page 31 of his memoir, *Sur la composition chimique de la canne à sucre de la Martinique*, speak of Mr. Avequin's researches as:

"Recherches que je n'ai pas citées plus haut qu'elles sont faites pour confirmer les idées de Dutrône et de Proust sur cette plante; il y trouve dix-sept matières différentes, et il admet qu'elle contient du sucre non cristallisable."

And of M. Péligot's opinion of the novelty and value of the ideas of Dutrône and Proust, your readers may judge from another passage on page 8 of the same memoir:

"On retrouve avec étonnement toutes ces opinions de Cazaux, de Dutrône, de Proust, admises sans discussion, dans l'ouvrage le plus moderne qui traite de la rèimprimé en 1831 à Philadelphie. Dans son chapitre sur la composition du canne à sucre; c'est un traité Anglais sur la nature et les propriétés du sucre de canne, par M. George Richardson Porter, publie à Londres en 1830, et jus de la canne, l'auteur traduit sans scruple le chapitre de Dutrône sur ce sujet, et ne soupçonne même pas que, dans l'espace de cinquante ans, ces opinions aient pu être quelque peu modifiées par suite des progrès des sciences et des arts chimiques."

I was also guilty of exposing my "own ideas on the defecation of the cane-juice," instead of adopting "the theory of defecation" of Mr. Avequin; of this he tells you that "a similar explanation, written by a distinguished lawyer of New-Orleans, was inserted in your Review, vol. ii. p. 335, in the year 1846," and that "errors and faults *so glaring* are *willingly overlooked* in this case, but they *cannot be tolerated* in a professor of chemistry." Although in the opinion of Mr. Avequin this intolerable exposition "clearly demonstrates that the theory of defecation by the use of lime, or by a milk of lime, is as yet unknown" to me, I cannot even plead ignorance in extenuation of my neglect of his "theory;" for it is given in the article on Cane-Sugar in the sixth volume of the treatise on chemistry of M. Dumas (p. 218), which I read attentively at the time of writing my report; and in which article M. Dumas also embodies Mr. Avequin's account of the saline matters in molasses, etc., ("voici d'après M. Avequin, à l'obligeance duquel nous devons les détails qui précèdent, les matières salines," etc., etc., page 227.) The truth is simply that I had not, and do not now see reason to have faith in the theory and researches of Mr. Avequin, notwithstanding M. Dumas may have cited them in his work; and I "exposed my own ideas," after examining the subject carefully, in the exercise of my independent judgment, because it was my duty so to do. I did not adopt Mr. Avequin's notions, and I did not see fit to assail them; I, therefore, simply passed them over in silence. "In this have I offended."

To my silence with reference to the "researches" of this gentle-

man there are, I believe, but two exceptions in my report; one is the paragraph on *cerosie*, already discussed, and the other is his analysis of the calcareous deposit which forms in the evaporating pans, which I gave on page 69 of my report, exactly as it is contained in and was copied from the treatise of M. Dumas (page 229, vol. vi.) I here quote the passage:

"This deposit has been analysed by Mr. Avequin, of New-Orleans, with the following results:

Sub-phosphate of lime,	92.5
Carbonate of lime,	1.4
Silica,	4.7
Phosphate of copper,	1.4
	100·0

"Mr. Reynolds obtained somewhat analogous results from a specimen procured by me from the battery kettle upon the Saratoga sugar estate of Drake, Brothers & Co., in the island of Cuba; the analysis of which was as follows:

Organic matter and water,	54·72
Sub-phosphate of lime,	11·90
Carbonate of lime,	33·25
Silica,	00·13
Oxide of iron,	a trace.
	100·00"

Although I have said that my assistant, "Mr. Reynolds, obtained somewhat similar results," (the degree of which similarity is, I confess, not very close,) this analysis of Mr. Avequin will serve to show that M. Dumas can sometimes yield too ready faith to "researches" unskilfully made, and even inadvertently commit errors in reporting them.

Let me refer the reader once more to the *Journal de Pharmacie*, t. xxvii. page 15, Paris, 1841, where he will find an article entitled: "*De la formation du cal dans les chaudières pendant la fabrication du sucre brut, (sucre de canne.) Par M. Avequin, pharmacien à la Nouvelle Orléans.* And let me also "appeal to all persons who have the slightest knowledge of chemistry," to decide whether the "*Examen du cal*," contained in that article, was performed in a manner which would indicate that the writer possesses that requisite skill and familiar knowledge of the apparatus, manipulations and methods of modern analytical chemistry, which would entitle his "researches" to confidence, or render it "intolerable in a professor of chemistry" to pass them over in silence; even if this silence be not the result of unbelief but of "ignorance," to which Mr. Avequin would fain ascribe it.

I wish not to inflict upon your readers more words than are necessary; and, therefore, I shall not copy the whole article of Mr. Avequin, but make extracts from it. A few only will be sufficient. He says (page 16):

"La formation du cal dans les chaudières à sucre est duc à la présence du biphosphate de chaux existant naturellement *en très-grande quantité* dans le jus de cannes; en y ajoutant un lait de chaux pour obtenir la défécation, l'excès d'acide du biphosphate se trouve saturé par cette base: il en resulte un sous-phosphate insoluble, etc."

In this "trés-grande quantité," I have no faith, for the analysis of Mr. Reynolds shows that a specimen of this deposit or "*cal*," contained 33·25 per cent. of carbonate of lime, and only 11·9 of sub-phosphate of lime, the residue being chiefly organic matter and water.

How happens it that Mr. Avequin does not also find 33·25 per cent. of carbonate of lime? And that, according to M. Dumas, he obtained 92·5 per cent. instead of 11·9 of sub-phosphate of lime? The answer is short, and I give it in Mr. Avequin's own words:

"100 parties de cal, *après avoir été calcinées* pour detruire la matière sucrée et les autres matières végétales, présentent à peu près la composition suivante:

Sous-phosphate de chaux	92·43
Chaux en partie carbonatée	1·35
Silice	4·70
Phosphate de cuivre	1·41
	99·89

Hence it appears from the words which I italicise, that Mr. Avequin *first calcined* the calcareous deposit, to destroy organic matter, and then analysed the residue! No wonder, then, that while Mr. Reynolds obtained 33·25 per cent. of carbonate of lime, Mr. Avequin tells us only of 1·35 per cent. of "chaux en partie carbonatée;" for he began by calcining (*for twenty-four hours!*) the substance which he proposed to analyze! There is an English phrase *to cook* an analysis, synonymous with the French "*bacler une analyse*," which Mr. Avequin has applied to my work, (page 24 of the Review.) To apply it to this case, it may justly be said that this *calcination for twenty-four hours* not only *cooked*, but literally *burnt up* Mr. Avequin's "examen du cal."

Let us see how he performed the operation, that we may judge whether he did it in the most approved style, and whether he can justly claim to be a skilful workman. He says of it:

"1,000 grammes de cal, après avoir été retirés de la chaudière à déféquer, comme il est dit plus haut, ont été chauffés à une chaleur modérée dans un creuset de Hesse, jusqu'à incinération parfaite. Dans le commencement de la combustion, il se dégage beaucoup de gaz hydrogène carboné qui brûle dans le creuset avec une flamme blanche bleuâtre; à mesure que la combustion avance, la flamme blanche disparait et elle est remplacée par une flamme violette ou bleue. Il faut tenir le cal long-temps à une chaleur légèrement rouge avant d'obtenir une incinération parfaite. Ces 1,000 grammes de cal ont été reduits à 492 grammes après une de 24 heures."

Now what confidence can be placed in such work? An analysis begun by an incineration of 1,000 grammes, or *more than two pounds*, in a *Hessian* crucible, for *twenty-four* hours, and this in the year 1841!! Assuredly such a Vulcan-like proceeding is in strict accordance with the modern style of substituting the neat spirit-lamp and mouth-blowpipe for the clumsy furnace and rough bellows of the alchymist; delicate vessels of platinum or porcelain for those of coarse earthenware; and very small quantities of matter for the large masses which used to be operated upon in days of yore, with such lavish waste of time, labor and materials!

Of this incineration of 1,000 grammes, which required so much time and trouble, and displayed such beautiful flames, what does M. Dumas say? Not one word! Of the calcareous deposit itself he says only:

"La défécation opérée par la chaux donne naissance à un dépôt de sous-phosphate de chaux. Cette matière s'attache à la chaudière à déféquer ainsi qu'aux chaudières suivantes, et elle y constitue une croûte épaisse qui est connue sous le nom de *cal*. Lorsque l'épaisseur du cal devient trop forte, on chauffe la chaudière à sec et on dilate assez le métal pour obliger le cal à se fendre et à se détacher. La formation de ce produit entraîne beaucoup d'inconvénients faciles à comprendre, pendant la durée de l'évaporation. Voici sa composition d'après M. Avequin:

Sous-phosphate de chaux	92·5
Carbonate de chaux	1·4
Silice	4·7
Phosphate de cuivre	1·4
	100·0"

You may now judge whether M. Dumas has given the composition of this "*cal*," or calcareous deposit correctly, and in accordance with Mr. Avequin's original paper in the *Journal de Pharmacie*. Has the distinguished French chemist "mutilated or disfigured" Mr. Avequin's "researches?" In view of his well-known accuracy, is it at all likely that M. Dumas took his description directly from Mr. Avequin's article in the *Journal de Pharmacie*, where the words "*après avoir été calcinées*" so closely precede the statement of the composition? And is it not more probable that he extracted his account from some of those statements of details furnished by Mr. Avequin, to which he alludes when he uses the abovementioned words: "voici d'après M. Avequin, à l'obligeance duquel nous devons les détails qui précèdent?"

Finally, in page 61 of the report of M. Péligot to Admiral Duperré, Paris, 1843, to which Mr. Avequin refers, (page 40,) in terms of dissatisfaction, while he at the same time endorses the professional ability of the author, the latter says:

"M. Avequin attribue la formation si fâcheuse de cette substance au biphosphate de chaux, qui selon lui, existe en très grande quantité dans la canne; mais, outre que cette dernière assertion est en contradiction avec toutes les analyses qui prouve que le phosphate de chaux n'existe pas en plus forte portion dans cette plante que dans les sucs séveux des autres végétaux, l'examen qu'il a fait de cette substance, examen qui laisse, d'ailleurs, beaucoup à désirer, conduit à une conclusion toute différente de la sienne."

Your readers can now decide for themselves whether Mr. Avequin's "researches" are more entitled to credit because they may have been communicated to M. Dumas, and noticed by the latter in his treatise on Chemistry Applied to the Arts; and whether, also, a certain "distinguished lawyer" of New-Orleans and "a professor of chemistry" have committed any "glaring errors and faults" by "exposing their own ideas on the defecation of cane juice." I take leave of those "researches" with the declaration that I have not the least objection to the proposed reward of $100,000 being offered by the planters, if they see fit.

Mr. Avequin seems to be very much perplexed, page 28, with my statement that a specimen of cane juice was "of the specific gravity 1·085, corresponding to 10° Baumé of the brass instrument I employed, but to 11° Baumé as indicated by the glass *pèse-sirop* belonging to Mr. Duggan." After asking "what can we think of that?" and pronouncing me unworthy of "confidence" as "an experimentalist" by reason of it, he triumphantly concludes as follows:

"Had the juice upon which the professor made his experiments a density of 1·085? Or did it weigh 10° in the *pèse-sirop* of Baumé? Or did it mark 11° in this same instrument? ***Fiat lux!*** For us, we will tell him that 1·085 density corresponds exactly to 11 1-2° of the *pèse-sirop* of Baumé, which makes a pretty considerable difference in its richness of sugar. We will show him this further on."

Now while I would be perfectly willing to receive knowledge, of which I may be ignorant, from Mr. Avequin, as well as from others, if properly communicated, I cannot accept from him erroneous assertions about matters of fact, concerning which I am well informed; especially, when those assertions are coupled with the imputation to myself of gross "negligence," and want of professional ability, because carefully performed experiments do not seem to confirm what he professes to have "established twelve years ago."

With regard to this "*Fiat lux!*" or most authoritative assertion that "1·085 density corresponds exactly to 11 1-2° of the *pèse-sirop* of Baumé," let the reader refer to standard works written by the most eminent scientific men, and to the most skilful experimental inquiries heretofore made by various persons, and he will find extremely discordant results given by them, in relation to the densities which correspond to the degrees of Baumé's hydrometers. For those who have not such books as this reference calls for, I here annex a short table of comparative data, compiled from the authorities whose names are above the vertical columns:

Degrees of Baumé's Pese-sirop.	Corresponding densities, or specific gravities.				
	Berzelius.		Francœur.	Delezennes	Fayen.
3°	1·020	1·019	1·0201	1·0219	1·026
6	1·040	1·038	1·0411	1·0448	1·052
9	1·064	1·057	1·0630	1·0687	1·080
12	1·089	1·064	1·0857	1·0937	1·106
15	1·114		1·1095	1·1200	1·142
28	1·140	1·118	1·1343	1·1475	1·168
41	1·170		1·1603	1·1764	1·187
24	1·200	1·161	1 1875	1·2068	1·213
27	1·230		1·2160	1·2389	1·254
30	1·261	1·210	1·2459	1·2727	1·276

Of the first two columns of this table, (see page 103, vol. viii. first edition of Berz. Traité de Chim.,) Berzelius says: "on voit donc, d'après le défaut d'accord entre les nombres à quel point la base admise par Baumé est inexacte."

In his excellent remarks, (*Mémoire sur l'Aréométrie*, page 25, Paris, 1842,) M. Francœur, says:

"Des expériences ont été faites par un grand nombre de savants pour trouver

les densités des liquides correspondantes aux divers degrés des aréomètres de Baumé, et leurs résultats sont discordants. Guyton, d'Arcet, Vauquelin, Bringley, Ure, Klaproth, Nicholson, etc., ont publié des tables de ce genre, et les chiffres présentent des différences notables. J'ai moi-même tenté des expériences avec des aréometres que je devais croire exacts, et je n'ai pu obtenir des résultats satisfaisants."

He also remarks, (page 24) after speaking of the defects of Baumé's hydrometers:

"Enfin, l'en n'a aucun moyen de vérifier l'exactitude de l'échelle d'un instrument, et l'on doit s'en fier à l'habileté et à la conscience du constructeur. Que la fabrication des thermomètres est supérieure, sous ce rapport, à celle des aréomètres!"

Finally, that it may appear that I knew something of the imperfection of Baumé's *pèse-sirop*, and of what I was about when I took the specific gravity 1·085 of a specimen of cane-juice, and at the same time observed and recorded the discordant indications 10° and 11° of two different instruments, your readers may refer to my first report on sugar, syrups, hydrometers, etc., made in 1845, (a year before I went to Cuba,) and published in Senate Doc. No. 165, 28th Congress, 2nd Session; in which they will find, (page 20) that I have said: "the instrument of Baumé often varies, however, even by whole degrees;" and that I have also discussed, (page 65,) the cause of this variation.

From the preceding facts, the reader can readily answer Mr. Avequin's question:

"What confidence can we place in an experimentalist who has not even proved his saccharometer?—who, before making his experiments, has not assured himself that it was exact?"

And he may, if he pleases, answer another question, to wit:—what confidence can be placed in the statements of a man who ventures to make dogmatical assertions about matters of which he is ignorant?

But what are the experiments which Mr. Avequin tells you are unworthy of confidence, because the "experimentalist" did "not prove his saccharometer?" They are entitled "comparative experiments on the yield in juice of the three varieties of cane." They are described in such a manner, that Mr. Avequin himself says of the description: "all this is very clear, and no person, however simple, can be deceived." They profess to be facts observed and recorded, with all the care and precision of minute weighing with a delicate balance and exact weights, in relation to quantities not too large to be easily managed by the experimenter himself; and of which facts he is, therefore, the immediate and responsible witness. They also show truths which flow as consequences from them. What fault then has Mr. Avequin to find with them? Forsooth! they do not accord with "experiments *made by me* and those made by M. Péligot of Paris," and therefore, "it is not possible to push negligence further." Concerning the experiments of M. Péligot, let the reader bear in mind that he never left Paris when he undertook to make researches on the sugar-cane of the French West In-

dies, and that he entrusted to others all the business of collecting and sending him materials. After expressing his *opinion* ("je pense") in p. 24 of his report, that the average proportion of woody fibre is from nine to eleven per cent. in mature canes, M. Péligot informs the reader that, "cette conclusion ne semble pas d'accord avec les résultats obtenus à la Martinique par M. Guignod, assisté de plusieurs délégués de la Société d'Agriculture de cette colonie," and that M. Guignod found 13 per cent. of woody fibre. He then proceeds to show how "il est très probable que ce désaccord n'est qu'apparent," and the argument he employs is directly applicable to my experiments which Mr. Avequin condemns; which argument is however of somewhat doubtful validity. Also, on pages 40 to 45 of his report, M. Péligot states the results of a number of his experiments, which gave for the proportion of woody fibre in canes of different ages, etc. the limits 7·9 to 17·5 per cent! Are these variations only apparent? Or is this "negligence which it would be impossible to push farther?" The whole story is simply that the proportion of woody fibre varies considerably in canes of different ages, sizes, etc. While, therefore, I maintain the truth of my own work, I am willing to admit that M. Péligot and Mr. Avequin may have correctly obtained somewhat different results from different materials.

I pass over the other criticisms of Mr. Avequin concerning matters which relate solely to my work; not for the reason that they may not be easily answered, but that I have already consumed more of my own time, and of the reader's attention, than I consider them entitled to receive. There is one thing, however, which should not be permitted to go unnoticed or perhaps unrebuked; I refer to what Mr. Avequin has said of the valuable and most beautiful method of ascertaining the proportion of crystallizable sugar contained in any substance by means of the circular polarization of light,—a method discovered and brought to a very high degree of perfection by M. Biot, one of the most eminent scientific men of France; and of which Mr. Avequin says, (p. 35):

"This method (that is, the one *used* by Professor McCulloh, for it is not his own,) is remarkable for its elegant and seducing simplicity. This cannot be denied; and persons having only a superficial knowledge of mathematics, and who are ignorant of chemistry, will readily yield to its influence, because they see an algebraic formula applied to a chemical analysis. But we must beware, and fortify ourselves against all this species of seduction."

Also, on pages 25 and 26, he says:

"The process followed with a little too much confidence by the professor, in the experiments on molasses and raw sugar, has been tried in France long ago. The principal fault of this method is, that it is only applicable to the simple cases of a dissolution of *pure sugar* in water. If the liquid sugar to be examined contain foreign substances in solution, matters gummy, mucous, lactose, glucous, glutinous, saccharates, in general, the hydrate of carbon and other substances badly defined, mineral and organic salts, they act in the same manner as crystallizable sugar, and lead the operator into error. In acting upon a solution of pure sugar, the mistakes are not less than from two to three per cent.; but in acting upon molasses, they become monstrous! I will return again to this subject."

"In estimating the quality of foreign molasses arriving in the northern ports, the professor has made serious mistakes; but, with the assistance of his favorite algebraic formula, and some logarithms, he arranges all that in the most elegant manner in the world; he extricates himself from this false position like a skilful man; to embellish his errors, he adorns them in a mathematical form! To say the least, it seems to me ridiculous to apply a learned algebraic formula to an experiment on molasses. We ought to have recourse to these means only when acting upon bodies perfectly well defined, admitted by all the chemists, and of which the elementary composition is known. Otherwise, I repeat it, we are subject to fall into serious mistakes."

There certainly was no necessity in a review of my report for Mr. Avequin's parenthesis ("that is the one *used* by Professor M'Culloh, for it is not his own.") In the introduction to that report I have myself said (page 4): "the method employed and chiefly relied upon in the analyses was that of M. Biot, based upon the circular polarization of light, originally described in the *Comptes Rendus des Séances*, and in the *Mémoires de l'Académie*, etc." And on page 23, I again refer to M. Biot's researches, as well as to a former report, (Sen. Doc. No. 165, 28th Cong.) in which I have given a full account of those researches, carefully compiled from and *accredited to his* original memoirs.

While I am not gifted with that degree of self-esteem which professes to "*borrow nothing from the writings of others;*" and while I rejoice that, in this land of liberty, knowledge, which the art of printing perpetuates and disseminates over the world, may be "*used*" as freely as the light of heaven, or the air which we breathe; I yet may truly say, that I always endeavor to "render to Cæsar the things which be Cæsar's," and that I have never sought to pluck or injure a single leaf of the laurel which adorns the brow of one of the most distinguished of French philosophers,—one who has spent a long life in scientific labors which have greatly increased the fund of human knowledge, and to whom, now venerable for his age, all younger votaries of science delight to pay the just tribute of their admiration, their reverence, and their esteem.

To the subject of the application of circular polarized light to chemical researches, M. Biot has for many years devoted much of his time and attention; and though Mr. Avequin speaks of it as a "process followed with a little too much confidence by the professor, and *tried in France long ago*," as if it was an old and exploded fancy, some of your readers doubtless know that it has again and again received the endorsement of the Academy of Sciences of Paris,—a body fully competent to judge of the merits of such matters. And if they will turn to the number of the *Comptes Rendus des Séances de l'Académie*, p. 240, t. XXVI, of February 21, 1848, *not very long ago*, they will there find the report of a committee composed of MM. Arago, Regnault and Babinet, (names not unknown to fame,) bestowing upon "cette curieuse branche d'optique industrielle," their most unqualified commendation; and in which report we also find the following statement:

"On sait que cette curieuse propriété d'inversion dans le sens du pouvoir rotatoire, si bien utilisée par M. Biot, appartient exclusivement au sucre de canne (C_{24}, H_{22}, O_{11}), que l'on extrait encore de plusieurs autres végétaux, et qu'elle *sert à reconnaitre la quantité de ce sucre engagée dans un mélange quelconque.*

Let the reader observe the words which I have italicized; let him bear in mind that "MM. les Sécretaires Perpétuels" have also said in the name of the Academy: "les conclusions de ce Rapport sont adoptées;" and then let him decide for himself which of the two opinions of this method is most worthy of credit, that of the Academy of Sciences of Paris, officially published in February, 1848, which pronounces it to be one which serves to determine the quantity of sugar contained *in any mixture whatever*, or that of Mr. Avequin, who says: "the principal fault of this method is that it is only applicable to the simple cases of dissolution of *pure sugar* in water."

All that Mr. Avequin says of this optical method of M. Biot proves only his entire ignorance upon the subject; and as for his criticism, that "it seems ridiculous to apply a learned algebraic formula to an experiment on molasses," I merely observe that algebra usually performs neatly and clearly what arithmetic attains clumsily and obscurely, and that no great amount of learning is required to understand or make simple algebraical calculations. But when a bungling and *erroneous* arithmetical operation is brought forward as a method of "the most rigorous exactness;" as one "in which all the chemists in the world have confidence;" as "the old method *which I use myself;*" and which is, *therefore*, "beyond all doubt more exact than that used by the professor," discovered by M. Biot and approved by the Academy of Sciences of Paris, though "infinitely more defective than the old one,"—what shall we say or think of such assurance and self-esteem? Is it of the degree which is offensive, and which may often be corrected by ridicule? Or is it of that degree which ceases to offend because it amuses; upon which ridicule is expended in vain? Or is it not rather of the still higher degree, which causes no emotion but that of pity for the misfortune of its possessor?

Mr. Avequin tells you that he "will return to this whole matter if there be any occasion for it." Let him do so, if he pleases, and as often as he may see fit; probably it will not interrupt me in the devotion of my time and attention to other subjects, or put me to the trouble of writing another word; certainly it will not offend me. And the only feeling which his attack causes me to entertain in regard to him is one of regret that, by attempting to lead others into error, he has compelled me to say things which may possibly cause them to believe his scientific pretensions to be only a dream which his fancy fondly cherishes,—a dream which I refrained from disturbing, and would fain have permitted him to enjoy in peaceful satisfaction.

I now turn to Mr. Valcour Aime's review, published in your Journal for March, 1848. In the first place, I will state generally that, so far from objecting that the errors in my several reports should be pointed out and corrected, I desire that it should be done. The United States Senate, at the instance of one of its members from Louisiana, recently ordered them to be re-printed in a single document, under my revision. The truths which they contain I

shall in this re-publication continue to assert. The errors, if known to me, I will in every instance endeavor to correct; and I shall be happy to receive from Mr. V. Aime, or any other gentleman, either through private or public channels, information which will enable me the better to perform my task, as well as to do justice to the sugar industry of Louisiana. I have no personal or other interest to promote, no prejudices to lay aside, no theories to maintain. The truth, and nothing but the truth, is all that I desire to believe or to publish.

Mr. Valcour Aime correctly represents the facts connected with my visit to Louisiana, as I have myself given them in my letter to Professor Bache, which forms part of the introduction to my second report. Of the shortness of that visit he says (page 255):

"The stay of Mr. M'Culloh in the state was, as I observed before, so very short, that he had no time to become well acquainted with the former situation of our sugar industry, and the various successful steps that have been taken to improve it. It is, no doubt, on that account that he has in the different parts of his report alluded somewhat unfavorably to our improvements."

It is true that I did not spend sufficient time in Louisiana to obtain all the information which I desired and considered important. I have already mentioned some of the circumstances which prevented my accomplishing more than I did. But that it may fully appear that I made the best use of my time, and that I did not shorten my stay unnecessarily, I will now also state that, during several of the few days which I spent in New-Orleans, while under orders to proceed with as little delay as practicable to Cuba, I was confined to bed by sickness. And when, after completing my work in Cuba, I was about to return to Louisiana to study the sugar industry of the state, I received at Havana a letter directing me to return at once to Philadelphia, where my services were needed and required in the Mint. A similar and still more urgent letter awaited my arrival at New-Orleans. I could not, therefore, protract my visit a day longer than I considered absolutely necessary; and if I devoted my time chiefly to inquiries about Rillieux's apparatus, it was because that apparatus was the only one in use of which I possessed no knowledge. I caused to be printed, both in English and French, a circular containing numerous interrogatories, which I left with gentlemen of the highest respectability in New-Orleans, to be given to the planters. I regret that I never received answers to any of those interrogatories. This fact I mention only in justice to myself; and although I was aware that gentlemen engaged in the sugar industry might shrink from communicating facts which they would conclude must be generally known, lest they should seem presumptuous, yet I would have been, and shall still be, glad to obtain much of the information asked for in that circular from any of the planters.

If in anything I may have said, I have done injustice to Mr. Valcour Aime, or to the other planters of Louisiana, individually or collectively, it has been solely from want of information; and in the re-publication of my reports, I will cheerfully render them all credit

which they justly claim, if they will enable me to do so by furnishing me with the requisite facts.

I am sorry to be obliged to differ slightly from Mr. Valcour Aime, with reference to a passage in my report, which he quotes (page 250,) and subsequently comments upon. The passage is as follows:

"The well-managed sugar estates, (furnished with highly finished and costly machinery,) which I visited, and which had each required, on an average, an investment of not less than two or three hundred thousand dollars, in fixed capital, had entirely dispelled from my mind all preconceived notions derogatory to the enterprise and intelligence of the Spanish creole; though under an oppressive government, and compared with that of a Louisiana planter, enjoying all the blessings of political freedom, exempt from heavy taxes, and protected against foreign competition by a high tariff."

I am willing to admit that Mr. Valcour Aime's inference, that the planters of Louisiana are here represented to be "in the arrear," may be and has been justly drawn from the language I employed; for it would warrant the inference. And I, therefore, take pleasure in disclaiming the interpretation which has been put upon my words. To the planters of Louisiana it is certainly of no consequence what I may or may not think of them; but I probably owe it to myself to say, that I do not consider, and never intended to represent them as inferior to those of Cuba. On the contrary, in view of the great comparative disadvantages of climate under which they labor, I am convinced that in Louisiana much greater skill is requisite and generally attained; and I am confident that in no part of the world is the culture and manufacture of sugar as well understood and practised as in that state. But while I freely acknowledge the agricultural and manufacturing superiority of the Louisiana planter, I can go no further.

I cannot again believe "those preconceived notions derogatory to the enterprise and intelligence of the Spanish creole," which were "entirely dispelled from my mind" by the first estates which I visited in the island of Cuba; and which would never have been entertained by me, if I had not been, in common with very many of the citizens of our country, misled by hearsay statements, calculated to give any but favorable views of the energy, intelligence and virtues of a most estimable people.

I have said:

"The planters of Cuba, whether we judge them by the progress made in improvements, by the skill exercised in the operations of manufacture, by the judicious management of their estates, or by the information and intelligence they display, must certainly be considered the equals of our own fellow-citizens; and that they do not realize far greater profits from their industry, is to be attributed not to inferiority, but to the tyranny of Spain."

In this, I did not mean to compare them particularly with the citizens of Louisiana, but with those of every part of the United States. I may justly claim to have seen much of our country, to have mingled freely with every class of its citizens, and to know something of them. I esteem them; I admire them. There is not another people on earth so blessed with happiness, knowledge, in-

elligence, and every virtue. I am proud of my countrymen, proud to claim fellowship with them, at home or abroad. This is not boastfulness, it is simply the truth. But I should be unjust to the creole population of Cuba, to the humble *montero* as well as to the wealthy planter, if I were to say of them that they are our inferiors. They are no mongrel race, like the population of Mexico; the purest blood of ancient Spain flows unmingled in their veins. The ashes of Columbus repose in the cathedral of Havana, and the people of the island are worthy descendants of his followers. I have observed them carefully; and I know them well, for I have been under their roofs and among them long enough to become acquainted with them. They inherit, and are by nature endowed with the noblest faculties. In his hut, made of the wood and thatched with the leaves of the royal palm, (*palma real,*) the poorest *montero* welcomes and presents you to his family with the manners of a polished gentleman; unconsciously displaying those domestic and social virtues which dignify and exalt human nature, however humble the lot of their possessor. Between the educated and refined society of Cuba and that of our Southern states, an American will perceive no difference, but that they speak another language. And on a plantation in Cuba, if he be familiar with southern life in our own country, he will find himself perfectly at home. Indeed, were he not surrounded by tropical plants and scenery, and constantly listening to the sounds of a foreign tongue, he might readily imagine himself to be still in the land of his birth. Yet, not unfrequently, some petty tyranny, growing out of the avarice of the captain of the *partido*, or a much grosser outrage, may call his attention to the fact that he is no longer in a land of liberty, but under military despotism. And a friendly visit from the good-natured *padre* may serve occasionally to remind him that the faith of the Roman Catholic Church is the only religion tolerated by the Spanish Government.

In all this, Mr. Valcour Aime and myself do probably agree, for he has not expressed his opinion of the people of Cuba in his review of my report, and I do not presume that it can be unfavorable. He objects only to my comparison of the planters of that island to those of Louisiana, with reference to the skill and advantages possessed by each; and considers me inaccurate in my statement, that the sugar estates of Guines are "well managed and furnished with highly finished and costly machinery," and that they "have each required, on an average, an investment of not less than two or three hundred thousand dollars, in fixed capital." I am perfectly willing to be corrected by Mr. Valcour Aime, with reference to the ownership of the Amistad estate, and to allow that it probably belongs to a charming widow, instead of her brothers, as stated by me; also that the Dégrand apparatus upon it "did not probably cost more than 25,000 dollars," instead of 50,000 dollars, "as currently reported in Guines," and as told to me, not, however, by the owner or her son, for I have not the honor of their acquaintance. But I am unwilling to admit, because Messrs. Valcour Aime and Lapice, experienced planters of Louisiana, "discovered nothing, in their visit to Guines, either in the general management of the sugar es-

tates, or in the buildings and improvements, which deserved peculiar praise," that I was wrong in praising them, in abandoning my prejudices, and in saying of them that they were "well managed, and furnished with highly finished and costly machinery." Upon the *high* finish of the machinery I will not insist, but of its excellence and costliness generally in the island of Cuba, being usually of American or English manufacture, there can be no doubt; notwithstanding it is admitted, as Mr. V. Aime says, free of duty.

I am equally unwilling to admit that I have erred in estimating the investment required by a sugar estate in Cuba at "not less than two or three hundred thousand dollars, in fixed capital;" though this estimate is probably excessive for the estates of Guines. It was based upon information concerning the value of estates in other parts of the island, considered by me not much unlike those of that particular district; and the language employed is loose and indefinite. I went to some trouble to obtain authentic data in relation to the values of estates in the island generally; and until it be clearly shown that I have been deceived, in which case I will bow to conviction and cheerfully adopt the truth, whatever it may be, I shall continue to believe the probable average value of a sugar estate in Cuba to be two or three hundred thousand dollars. One hundred thousand dollars is, I believe, the cost of a small estate, manufacturing about one thousand boxes of clayed, or five hundred hogsheads of muscovado sugar; and three hundred and fifty thousand dollars that of a very large estate, producing five thousand boxes of clayed sugar.

In reference to this matter, as well as to some others in which Mr. Valcour Aime and myself differ, I submit the following detailed statement; for the authenticity of which I can vouch. It may, however, contain errors, for which I am not responsible. I give it as it was furnished to me:

VALUE OF A SUGAR ESTATE IN CUBA, WITH ALL ITS APPURTENANCES, MARCH, 1846.

LANDS.—55½ caballerias* at $1,000,	- - - -		$55,500 00
28 of which are in cane			
8 " " pastures			
2 " " vegetables			
3 " " fallow			
14½ " " woods			
CROP.—20 caballerias of cane in good condition, at $1,200	- - -	24,000 00	
8 ditto in poor condition	- -	4,000 00	
25,000 plaintain trees at 12½ cts.	-	3,125 00	
Orchard trees, &c.	- - -	100 00	
			31,225 00
ANIMALS.—125½ yoke of oxen at $59,50	-	7,467 25	
30 mules, $51,00	- - -	1,530 00	
5 horses, 34,00	- - -	170 00	
15 cows, 25,00	- - -	375 00	
24 calves, 5,00	- - -	120 00	
267 sheep, 1,00	- - -	267 00	
			9,929 25

* One caballeria is equal to 33½ acres.

NEGROES.—4 negro overseers at	$600	- -	2,400 00	
1 " machinist "	650	-	650 00	
11 prime men 1st class "	550	- -	6,050 00	
13 prime men 2d class "	500	-	6,500 00	
31 able men 1st class "	450	- -	13,950 00	
57 able negroes "	400	-	22,800 00	
28 " "	350	- -	9,800 00	
12 " "	300	-	3,600 00	
2 " "	250	- -	500 00	
10 " "	200	-	2,000 00	
3 " "	150	- -	450 00	
10 negro boys "	100	-	1,000 00	
6 " "	50	- -	300 00	
				70,000 00
6 negro women (prime)	400	-	2,400 00	
49 "	350	- -	17,150 00	
22 "	300	-	6,600 00	
9 "	250	- -	2,250 00	
8 negro girls	200	-	1,600 00	
6 "	150	- -	900 00	
4 "	120	-	480 00	
4 "	100	- -	400 00	
12 "	50	-	600 00	
				32,380 00

BUILDING.—One large engine and boiling-house, 250 feet long, of widths from 70 to 100 feet, with two steam-engines, four trains sugar pans of iron, on the Jamaica plan, and all necessary appurtenances, - - - - - - 38,000 00

Two large purging-houses, built of stone and wood, with tiled roofs, for claying 11,000 pots of sugar, with railway conveniences, cars for railway, and machinery for raising and mixing clay, &c. - - - - - - - 25,000 00

One large stone dwelling-house, with yard and garden attached, - - - - - - - 4,000 00

One large square block of stone-buildings, 52 rooms, and yard in centre, for negro dwellings, size 300 by 200 feet, - - - - - - 6,000 00

One square stone building, with yard in centre, divided into several large rooms, for a hospital, - - - - - - - - - - 2,500 00

One large stone building, including the furnace for drying sugar, and the packing-room, - 6,000 00

One large house, 180 by 70 feet, for the purpose of drying cane-trash, with railways from the mill, &c. - - - - - - - - - 2,700 00

One small divided dwelling of stone, for the engineer and mayoral (overseer,) - - - - 1,500 00

One clock steeple, with clock and bell, - - 800 00

One stable for fourteen horses, - - - 350 00

One coach-house, - - - - - - - 350 00

One small pump-house, - - - - - 250 00

Other minor buildings on different parts of the estate, - - - - - - - - -	725 00	
		88,175 00
IMPROVEMENTS.—One large stone reservoir for holding 12,000 cubic yards of water, - -	5,000 00	
One smaller ditto for watering cattle, - -	2,000 00	
One large stone water tank, to contain 70 pipes of water, - - - - - - - - -	800 00	
One well, 180 feet deep, with tanks, buckets and machinery for drawing water, - -	500 00	
Three wells on different parts of the estate, -	500 00	
One bell-post and bell weighing 800 pounds, -	500 00	
One kiln for burning tiles and bricks, - -	300 00	
One lime kiln, - - - - - - - -	200 00	
One railway from the boiling-house to the purging-house, - - - - - - - -	300 00	
One railway for discharging the clay at a distance from the buildings, - - - - -	200 00	
One railway for conveying fuel from the bagasa-house to the furnaces, - - - - -	200 00	
One railway and cars for conveying sugar to the drying-house, - - - - - - - -	300 00	
4,848 fathoms of stone fence or wall, on the boundaries of the estate, at $1,00, - -	4,848 00	
1,140 fathoms of hedge fence at 25 cts. - -	285 00	
One large stone bridge and embankment over a stream on the estate, - - - - -	1,000 00	
Several small stone bridges and stone drains for water on different parts of the estate, - -	2,000 00	
Two fire-engines, with hose, buckets, &c. -	1,000 00	
Tools and utensils of every sort, including 34 ox-carts, those of the carpenters, masons, engineer, &c. - - - - - - - - -	2,221 00	
		22,154 00
Sum total, - - - - - - - - - -		$309,363 25

RECAPITULATION.

Lands, ...	$55,500 00
Crop, ...	31,225 00
Animals, ...	9,929 25
Negroes, ...	102,380 00
Buildings, ...	88,175 00
Improvements, ...	22,154 00
Total, ...	$309,363 25

EXPENSES OF THE SAME ANNUALLY.

In cattle, horses and mules, - - - - -	$2,300 00	
Annual consumption of meat for 310 negroes, 140 lbs. at $6 per 100 lbs. - - - - -	2,604 00	
Annual consumption of corn, 325 lbs. per day, at $1,20 per 100 lbs. - - - - - -	1,423 50	
800 mule loads of plantains at 75 cents, - -	600 00	
Clothing at $3,50 per head, - - - -	1,085 00	
		8,012 50

Salary of administrator (agent,)	2,000 00	
" engineer,	1,200 00	
" mayoral (overseer,)	500 00	
" mayordomo (clerk,)	480 00	
" physician,	510 00	
" two sugar boilers for six months,	1,200 00	
" carpenters,	1,000 00	
" ploughman,	300 00	
" mule-driver,	300 00	
" men to take care of cattle,	360 00	
		7,850 00
Freight of transportation by mules of 4000 boxes of sugar from the estate to the place of shipment, including storage at $1,75 per box,	7,000 00	
4000 boxes at $1 per box,	4,000 00	
450 hides at $2,50,	1,125 00	
40 kegs of 10 and 12 penny nails at $8,	320 00	
15 kegs of 4 penny nails at $8,	120 00	
		12,565 00
Tax of 2½ per cent. on the value of the estate,	7,734 00	
Loss in negroes by death and total extinction of their value at fifty years,	5,119 00	
Minor expenses, including the hospital and medicine bill,	2,143 00	
		14,996 00
Total,		$43,423 50

PRODUCE OF 4,000 BOXES, THE AVERAGE ANNUAL CROP.

1,333 boxes of white sugar at $4,50 per 100 lbs., 425 lbs. per box,	$25,493 62	
1,333 boxes of brown sugar at $3 per 100 lbs.	16,995 75	
1,334 boxes of *cucuruche* brown at $2,50 per 100 lbs.	14,173 75	
4,000 boxes, &c., paid by merchants at $3,25 per box,	13,000 00	
800 hogsheads of molasses at $2,50,	2,000 00	
		$71,663 12
Deduct expenses,		43,423 50
Net profits,		$28,239 62

Of Mr. Valcour Aime's remark, that:

"If the sugar estates which the Professor has seen near Guines had each required on an average, as he was made to believe, an investment of *not less than two or three hundred thousand dollars, in fixed capital*, our northern citizens might well have asked why we complain of not getting four cents for our sugar when the people of Cuba can afford to give theirs for two cents, after undergoing such enormous expenses."

I would simply say, that I fear it will always be difficult to persuade consumers that they should purchase at high prices rather than at low. And of his subsequent remark concerning myself, that:

"Among the advantages which he enumerates as flowing from that government he might very well have left out, in a report printed in 1847, the protection against foreign competition by *a high tariff*."

I will observe, that the tariff to which I referred was that which was in operation when I was in Cuba, the tariff of 1842, levying upon brown sugars the duty of $2\frac{1}{2}$ cents per pound, and 4 cents upon white clayed,—rates which certainly were high if the planters of Cuba can afford to sell their sugars at two cents, as Mr. V. Aime asserts. And if my allusion to a tariff be supposed to have been the expression of political opinion, I disavow all such intention. In the execution of the scientific work entrusted to me by the government, I have studiously endeavored to abstain from all interference with questions of policy and conflicting sectional interests; and if the allusion to the protection of a high tariff be an infringement of this rule, it was purely accidental.

Mr. Valcour Aime points out very correctly and forcibly the great advantages of the climate of Cuba over that of Louisiana for the production of sugar. But I cannot agree with him in the following remarks:

"The slaves, by which their canes are cultivated, are, in spite of the suppression of the slave trade, imported from Africa at a cost which on an average does not exceed for each the price in Louisiana of a good pair of mules. The climate permits these slaves to be worked with as few clothes as they were in the habit of wearing in their native country. A patch of bananas, which, when once planted, gives every year a new crop from the sprouts, is all the feeding they require; whilst our slaves are generally at least as well fed and clothed as laborers are in Europe."

I do not deny that slaves are still brought from Africa to Cuba, nor do I mean even to palliate the slave trade, which is now as universally as it is justly condemned; though I believe that the share which Cuba has in it is to be censured far less severely than the heartless avarice of those who continue to prosecute it, and who dwell in northern climes.

Of the price of a good pair of mules in Louisiana, I have no knowledge; yet I have a vague impression of having heard of enormous fancy prices being there paid for large animals of that kind. But it is well known, that in Cuba negroes are divided into three kinds or classes: *criollos*, creole negroes; *ladinos*, those who have acquired the Spanish language, and who were imported several years ago; and *bozales*, recently from Africa, and speaking only their native tongue. Of these negroes the *criollos* are by far the most intelligent, virtuous and efficient; they therefore command good prices. Next in value are the *ladinos*, if able-bodied; and lastly, the *bozales* are mere savages, ignorant of civilization, stupid, and very worthless. In view of these facts, I do not think that the relative skill of the planters of Cuba and Louisiana can be estimated by the number of pounds of sugar produced to the working hand. The slaves of Louisiana are civilized and intelligent; they are all natives of our country, and infinitely superior to the *ladinos* or *bozales* of Cuba; also they are not only, as Mr. Valcour Aime says, "as well fed and clothed as labourers are in Europe," but they are generally far better fed, better clothed, better provided for, and better treated in every respect. He is certainly mistaken in supposing the slaves of Cuba to be fed only on bananas, and equally mis-

taken with reference to their clothing. Of this he would have been aware if he had observed them more attentively, or if he had noticed them wrapped in woollen garments during the prevalence of a norther, as well as on Sunday in their best attire. And if, when at work in the sun or in the boiling-house, the men usually appear with the upper part of the body bare, it is not because they have no clothing, but because they prefer to divest themselves of it.

In conclusion, I repeat the declaration I have made in the introduction to my last report on sugar, that "I am fully conscious of its imperfections." And I am pleased to think that it may be useful, notwithstanding its faults and errors, if these are not allowed to escape attention, and especially if they lead indirectly to investigation and the establishment of truth.

Very respectfully,
Your obedient servant,
RICHARD S. M'CULLOH.

Mint of the United States,
Philadelphia, July 27th, 1848.

NEW PROCESS OF SUGAR-MAKING.

BY this new process of sugar manufacture, three important points are likely to be gained, viz. cheapness, *simplicity* and effectiveness. However, I will explain the mode and let it speak for itself. As the juice runs from the mill, it is strained through inverted conical No. 16 wire gauze strainers, to rid it of impurities as much as possible. I may here remark, that these strainers do not choke. The juice thus strained, passes into the ordinary wooden juice boxes as usual, with this exception—the boxes are now provided with a three-inch pipe, perforated entirely over its under semi-circular surface, with one-eighth inch apertures; this pipe passes the whole length of the box, lying at the bottom and in the centre. Every box is similarly provided with a jet-tube, each of which are connected with a main, and provided with a clarifier valve. The main leads from the top of the heater for the conveyance of waste steam to the boxes, for the purpose of concussion clarification. One simple butterfly-valve turns the waste steam into use for clarification, or into the atmosphere, at the will of the operator. The heater should not be altered beyond a small indicating and self-adjusting cold water-cock, which is as infallible as it is simple. Worms, dividings, discs, separate cold water chambers, &c., have been found troublesome and dangerous, on account of inequalities of temperature, according to the quantity of feed water required.

I do not claim this clarification, as the plan is several years old; but I have made several improvements and simplifications in its arrangements. (*See Planter's Banner, July 6th*, 1848, *and July 13th.*) The cane-juice being clarified, it is next to be concentrated; for this purpose, I use a double or treble flue-kettle, with a pneumaticus attached. No part of this arrangement is new, except the particular form of kettle, its application and arrangement, which are all I claim. By the use of this apparatus, carbonizing and caromelizing are prevented; superior sugars are produced, and the new form will not use more than one and a half cords of wood to the hogshead. The whole process for a large estate, will not exceed in cost $2,000. I will now describe it a little more fully. The flue-kettle is similar to a double flue boiler, with this difference, it is open at the top, and thrown out

somewhat so as to represent an inverted semi-ellipsis endwise; and when it is charged, the birds-eye view is a rectangular vessel. One negro will attend it, as the labor is reduced to a mere trifle. Through the entire pan, passes one or more of Kneller's air-tubes, supplied by a blowing machine, which are similar to the perforated tubes used for waste steam in concussion clarification. Through those apertures, jets of air pass, which cause quick evaporation and a certain low temperature of boiling, say 180° F. Planters must use great caution and care as regards the alteration of their heaters, for, from the waste steam, concussion clarification, or danger, hindrance, great loss of fuel, &c., will surely occur, if they complicate this affair. In some cases, I join the waste steam-pipe to the eduction pipe near the cylinder, and just allow it to pass through an open top heater. This is the safest and best plan yet introduced, and I hope all will adopt it.

Yours, respectfully,
WM. F. WILKINS.

FRANKLIN, *Attakapas, La., Aug. 10th*, 1848.

AGRICULTURE OF THE SOUTH AND WEST.

THE COTTON INTERESTS.

COTTON CROPS—MANUFACTURES AT THE SOUTH—CROP 1847-48—PRICES OF COTTON—PROSPECTS OF FOREIGN DEMAND, &c.

GEORGE G. HENRY, Esq., of Mobile, a merchant whose accurate appreciation of statistics, and deductions from them, are highly estimated upon every hand, has published a circular of the 7th July, which is one of the most interesting papers we have seen for a long time. In regard to the extent of the coming crop and prices, Mr. H. remarks:

"The average of the last five years is 2,140,000 bales—last seven, 2,160,000. The Atlantic states are investing in manufactures and rail roads very rapidly, and with the deterioration of their lands, hence the general falling off in their crop. Although their crop was good the past year, it has fallen off largely from those of some years. In Georgia alone, they had reported to the last Legislature thirty-two cotton factories, while in Virginia, North and South Carolina, they are increasing; and their extending lines of rail roads, iron forges, &c. are properly diverting the labor and capital from planting. Sugar in Florida is becoming popular, and there they have practically illustrated that the South is destined to become a great manufacturing country, as they have one cotton factory I know of, in which *slave labor* is entirely and successfully used; and as that labor is, with cotton at even 8a10c. a pound, the cheapest in the world, we can evidently rival any country and will, if the price of cotton does not improve, and we are not cunningly drawn from it. Our Southern legislators ought to consider on such modes as would develope these facts, and encourage the planter to embark in manufactures. The cheapest water-power, the cheapest labor, material cheaper, food cheaper, no interruption by seasons, what is it but a hope of soon obtaining better prices for cotton, that prevents its being rushed into. No country can compete with us. Your negro women and children are quite sufficient for it; their numbers there would increase more rapidly, and when water power is not convenient, steam-power is said by practical men, to be very nearly as cheap, and some argue that it is sometimes preferable.

"In Alabama, investments in cotton factories, iron forges, rail roads, &c., are being made, and emigration from this as well as the Atlantic states has been considerable for several years, and Louisiana, Mississippi, Texas and Arkans as have been receiving it, and hence their production is increasing in proportion to the falling

off of the other divisions of the cotton region. The crop to our west was about as good as is possible to gather. It exceeds, inclusive of Texas, by about 150,000 bales, the largest ever before made there, that of 1842—3, say 1,060,000, which was made when a large quantity of the lands now in sugar in Louisiana were cultivated in cotton.

"With the prospect prevailing and prices getting for cotton in February, March and April, 1847—say 10½a12c.—there can be no question but that all planters strained themselves for as large a crop as they could possibly cultivate and gather, while in the same months of this year prices and prospects were positively disheartening. As the season has been unusually early and favorable, and so far as I have heard is still so, keeping the foregoing in mind, I admit our crop with a continuance of fine seasons, fine fall, and late frost, might reach 2,500,000 bales—being 100,000 bales more than was ever before saved in one year. It must be remembered, however, that favorable as the season so far generally has been, it might so alter, as this shall turn out a short crop.

"I submit the above to my friends, and by reference to estimates made by me at different periods in the last three years, it will be perceived I have been heretofore near enough to the quantity realized for all practical purposes, which were as follows:

December 5,	1845—Estimate		2,150,000	Crop was 2,034,000
"	" 1846	"	1,700,000	" " 1,778,000
"	" 1847	"	2,185,000	Will be about 2,285,000
In July,	1846	"	2,000,000	Crop was 1,778,000
"	1847	"	2,150,000	2,285,000

I turn to the prospects of demand and price. Cotton factories are springing up everywhere on the continent of Europe, and the people are laying aside their flax and hemp for common wear, and adopting fabrics of cotton. The supply from India and elsewhere it is also ascertained cannot increase. Indeed those regions import more pounds of cotton goods than they export to Europe, and consumption amongst them will increase while the cost of production for their very inferior article is too great to be largely continued. It has been calculated if France and Germany, with populations of 70,000,000, should consume cotton in proportion to Great Britain and the United States, the increased consumption would be nearly as much as the whole crop of the United States for 1846 was, which is rapidly in progress in some portions, as well as in Spain and Russia. I think the Republic of France will maintain herself, and that she will soon become sufficiently settled for business to pursue a regular course. Her quiet will influence the quiet of the other nations. Tranquillity restored in Europe, with the realizing a fine harvest, of which they have every prospect now; money abundant and cheap; stocks of manufactured goods everywhere low; home trade of Great Britain now good; India and China good; South America and this country good; the Mexican war ended and her trade open; exchanges in favor of cotton; freights low; with the uncertainty of our cotton crop, their only source of supply, and the necessity of manufactures to provide themselves against contingencies, will cause an energetic demand: and should any important check occur to the probable extent of this crop, prices would not only improve, but I should not be surprised to see them run up to extremes."

2.—INTERNAL IMPROVEMENTS IN TEXAS.

We have lately received the Report of the Trinity Convention, for the improvement of the river of that name in Texas, and are pleased with the exhibition of public spirit now manifesting in that state. The Report thus discusses the importance of the Trinity valley:

"In looking over the interior of Texas, we are struck with the extraordinary fertility, and peculiar agricultural advantages of the region of country watered by the Trinity river, its tributaries, and the minor streams adjacent and flowing parallel with it towards the Gulf of Mexico. There is probably no part of the great West which possesses so many local advantages. Situated in that happy latitude which knows neither the extremes of heat or cold—abounding with the purest water—a dry and salubrious atmosphere, and a soil yielding every production, there is no portion of the world which holds out so many inducements to the settler and emigrant, and none which will more amply reward his toil.

"On the lower Trinity, and around the coast of Galveston Bay, is the region of sugar cane and Sea Island cotton. The sugar cane must eventually become the staple production of the country in this region. It yields abundantly, and produces sugar of a superior quality to that made in Louisiana, and is now attracting sugar planters from that rich and flourishing state. Cane of a good quality has been produced in the Trinity valley, as far north as 32°, and it may be produced in a higher latitude, but not as an object to claim the attention of the planter. Its profitable cultivation must be confined within fifty or sixty miles of the Gulf coast. North of the cane region, in the valley of Trinity, the region of corn and cotton begins, and for the production of these great staples, no portion of the world in the same latitude can produce a parallel. The upland, as well as the bottom land, produces cotton abundantly, and the fibre is as fine, and the lint as strong as any in America. There are few of the grain growing states in the North and West that produce more corn to the acre, or of a better quality. North of the corn and cotton portion of the valley, among the beautiful and fertile prairies of the upper Trinity, the wheat country begins. Emigrants from Mexico, Indiana, Ohio, Illinois and Michigan, have tested the wheat-growing qualities of the soil and climate in that portion of our state. The result of their experience is a firm conviction that none of the great wheat-growing states of the Union can surpass the country in the vicinity of the "three forks of the Trinity," in the extent of the production or the quality of the wheat. We feel assured that if the means of transportation were furnished our population in that productive portion of the state, it would not only supply Texas with flour, but would leave a surplus for exportation. For the stock-raiser, the valley of the Trinity offers many inducements. The immense grassy plains of prairie and woodland, the cane-bottoms, with never-fading verdure, and the immense fields of wild rye, green in midwinter, exhibit that the constant labor and the toil of man are not necessary to rear cattle or stock of any kind, and that they grow and flourish without his care. We may here add that the mineral resources of the country are great. Iron is abundant, and everywhere coal, &c., exist.

MISCELLANEOUS STATISTICS, ETC.

I.—POPULATION, DEBT, LOANS, ETC., UNITED STATES.

From a circular for the European Correspondence of CAMMANN & WHITEHOUSE, we are permitted to copy the annexed interesting tables, compiled at their request by the Treasury Department, in order that official information might be given to foreigners desirous of investing in AMERICAN STOCKS—of the extent of our population, resources and debt.

There is not another country under the sun that can exhibit such resources and so small a debt:

STATEMENT, exhibiting the population of the United States, the Public Debt, the receipts from Loans and Treasury Notes, the receipts, exclusive of Treasury Notes and Loans, and the payments on account of the debt each year, from 1791, *to June,* 1843, *inclusive.*

Year.	Population.	Debt.	Receipts from Loans and Treas. Notes.	Revenue exclusive of Loans & Treas. Notes.	Principal and interest of debt paid.
Census of 1791.	4,067,371..	$75,463,476 52..	5,791,112 56..	4,418,91319..	5,287,949 50
2.	4,205,404..	77,227,924 66..	5,070,806 46..	3,669.960 21..	7,263,665 99
3.	4,343,457..	80,352,684 04..	1,067,701 14..	4,652,923 14..	5,819,505 29
4.	5,481,500..	78,427,404 77..	4,609.196 78..	5,431,904 87..	5,801,578 09
5.	4,619,543..	80,747,587 39..	3,305,268 20..	6,114,834 59..	6,084,411 61
6.	4,757,586..	83,762,172 07..	362,800 00..	8,377,549 65..	5,835,846 44
7.	4,895,629..	82,064,479 33..	70,135 41..	8,688,780 98..	5,792,421 82
8.	5,033,672..	79,228,529 12..	308,574 27..	7,900,495 80..	3,990,294 14
9.	5,171,715..	78,408,669 77..	5,074,646 53..	7.546.813 31..	4,596,876 78
Census of 1800.	5,309,758..	82,976,294 35..	1,602,435 04.	10,848,749 10..	4,578,369 95
1.	5,502,772..	83,038,050 80..	10,125 00.	12,935,330 95..	7,291,707 04
2.	5,695,787..	80,712,632 25..	5,597 36.	14,994,793 95..	539,004 76

Year.	Population.	Debt.	Receipts from Loans and Treas. Notes.	Revenue exclusive of Loans & Treas. Notes.	Principal and interest of debt paid.
Census of 1803.	5,888,801..	$77,054,686 30..	.....	11,064,097 63..	7,256,159 43
4.	6,081,816..	86,427,120 88..	9,532 64.	11,826,307 38..	8,171,787 45
5.	6,274,830..	82,312,150 50..	128,814 94.	13,560,693 20..	7,369,889 79
6.	6,467,845..	75,723,270 66..	48,897 71.	15,559,931 07..	8,989,884 61
7.	6,660,859..	69,218,398 64..	.....	16,398,019 26..	6,307,720 10
8.	6,853,874..	65,196,317 97..	1,882 16 .	17,060,661 93.	10,260,245 35
9.	7,046,888..	57,023,192 09..	.....	7,773,473 12..	6,452,554 16
Census of 1810.	7,239,908..	53,173,217 52..	2,759,992 25..	9,384,214 28..	8,008,904 46
11.	7,479,729..	48,005,587 76..	8,309 05.	14,423,529 00..	8,009,204 05
12.	7,719,555..	45,209,737 90..	12,837,900 00..	9,801,133 76..	4,449,622 45
13.	7,959,381..	55,962,827 57..	26,184,435 00.	14,340,409 95.	11,108,123 44
14.	8,199,208..	81,487,846 24..	23,377,911 79.	11,181,625 16..	7,900,543 94
15.	8,439.034..	99,833,660 15..	35,261,320 78.	15,696,916 82.	12,628,924 35
16.	8,678,860..	127,334,933 74..	9,494,436 16.	47,676,985 66.	24,871,082 93
17.	8,918,687..	123,491,965 16..	734,542 59.	33,099,049 74.	25,423,036 12
18.	9,158,513..	103,466,633 83..	8,765 62.	21,585,171 04.	21,296,201 62
19.	9,398,339..	95,529,648 28..	2,291 00.	24,603,374 37..	7,703,926 29
Census of 1820.	9,638,166..	91,015,566 15..	3,040,824 13.	17,840,669 55..	8,628,494 28
1.	9,959,965..	89,987,437 66..	5,000,324 00.	14,573,379 72..	8,367,093 62
2.	10,281,765..	93,546,676 98..	.....	20,232,427 94..	7,848,949 12
3.	10,603,565..	90,875,877 28..	.....	20,540,666 26..	5,530,016 41
4.	10,925,365..	90,239,777 77..	5,000,000 00.	19,381,212 79.	16,538,303 76
5.	11,247,165..	83,788,432 71..	5,000,000 00.	21,840,858 (2.	12,095,344 78
6.	11,568,965..	81,054,059 99..	.....	25,260,434 31.	11,041,032 19
7.	11,890,765..	73,987,357 20..	.....	22,966,363 96.	10,003,668 35
8.	12,212,565..	67,475,043 87..	.....	24,763,629 23.	12,163,438 07
9.	12,534,365..	58,421,413 67..	.....	24,827,627 38.	12,383,867 78
Census of 1830.	12,856.165..	48,565,406 50..	.....	24,844,116 51.	11,355,748 22
1.	13,277,415..	39,123,191 66..	.....	28,526,820 82.	16,174,378 22
2.	13,698,665..	24,322,235 18..	.....	31,665,561 16.	17,840,309 29
3.	14,119,915..	7,001,032 88..	.....	33,948,426 25.	1,543,543 38
4.	14,541,165..	4,760,082 08..	.....	21,791,935 55.	6,176,565 19
5.	14,962,415..	351,289 05..	.....	85,430,187 10.	58,191 28
6.	15,383.665..	291,089 05..	.....	50,826,796 08.	.....
7.	15,804,915..	1,878,223 55..	2,992,989 15.	24,890,864 69.	21,822 91
8.	16,226,165..	4,857,660 46..	12,716,820 86.	26,303,561 74.	5,605,720 27
9.	16,647,415..	11,983,737 53..	3,857,276 21.	30,023,966 68.	11,117,987 42
Census of 1840.	17,068,665..	5,125,077 63..	5,589,547 51.	19,442,646 08.	4,086,613 70
1.	17,560,082..	6,737,308 00..	13,659,317 39.	16,850,160 27.	5,600,689 74
2.	18,051,499..	15.028,486 37..	14,808,735 64.	19,965.009 25.	8,575.539 94
June 30. 3.	18,542,915..	27,748,188 23..	12,551,409 19.	8,231,000 26.	861,596 55
4.	19,034,332..	24,748.188 23..	1,877,847 95.	29,320.707 78.	12,991,902 84
5.	19,525,749..	17,093,794 80..	.....	29,941,853 90.	8,595,049 10
6.	20,017,165..	16,750,926 33..	.....	29,699,967 74.	1.213,823 31
7.	20,508,582..	38,956,623 38..	28,900,765 36.	26,437.403 16.	6,719,282 37
8.	21,006,000..	58,526,349 37..	21,256,700 00*	35,425,750 59*	1,524,9197 21

Present debt, including the amount to be realized on the 1st of May, 1848, of the Loans of 1846, 1847 and 1848, $65,737,008 92.

TREASURY DEPARTMENT,
Register's Office, August 5, 1848.

DANIEL GRAHAM, *Register.*

2.—POPULATION OF CANADA.

A Montreal paper says that the result of the census, just completed, of Upper Canada, will give that section of the province a population from 689,000 to 700,000 souls; while, by the census of 1842–3, it was only 401,061, giving an increase in five years of nearly 300,000. The last census for Lower Canada was taken in 1844, when the population was 699,806 souls, the increase upon which, during the last four years, is calculated, by reference to preceding terms at which censusses have been taken, to be about 70,000, giving this section of the province a present population of about 770,000. The population of Upper Canada would

* Estimated returns not completed.

thus appear to increase at the rate of about 40,000 per annum, and Lower Canada at that of about 17,000 per annum. Supposing these relative rates of increase to be maintained, the year 1852 will see Upper Canada with a population of 359,000, and Lower Canada with only 840,000; the year 1862 will give the former a population of 1,259,000, and the latter only 1,015,000 souls. The experience of the past, and the present condition of Great Britain and Ireland, will, we think, justify the belief, that the increase of our population by immigration will be greater during the next twelve years than it has ever hitherto been, and that the relative proportions of such increase will be largely in favor of Upper Canada. The probability, then, is that by the year 1862 the western section of the province will contain one million and a half of inhabitants, or one-third more than that of the eastern section.

3.—INTERESTING STATISTICS.

A work has lately been published in England, of which one of our contemporaries says:

"It appears by this work, that France exceeds in most things all the great powers combined; but when she is contrasted with Great Britain she is as far behind the latter as she is in advance of the other continental states. Thus, France exceeds the three powers, Austria, Russia, and Prussia, in the extent of her trade. Great Britain, in her commerce, doubles France. The latter doubles the three powers in the extent of her navy; Great Britain herein more than trebles France. In the extent of its middle class, France exceeds the continent; she has 1,164,000 subjects, enjoying an income above twenty-one pounds sterling. Great Britain has more than two millions and a quarter, enjoying upwards of forty pounds annually. In the quantity of food consumed by its population, France averages double the quantity of wheat, and double the quantity of sugar consumed by the population of the absolutely governed states; in France, 361 lbs. of wheat, and from six to seven and a quarter pounds of sugar are consumed per head. In the United Kingdom, 336 pounds, (and taking Great Britain, only 446 pounds) of wheat and nineteen pounds of sugar, per head, are consumed. During 1847, £63,000,000 were raised in France. The revenue of Russia, Prussia, and Austria, whose subjects are still more severely taxed, in proportion to their ability to pay, is collectively, £43,000,000. The United Kingdom levies only fifty millions of taxes; but, as its income is computed at 550 millions, and that of France at 320 millions of pounds sterling, it is obvious that Great Britain could, without greater pressure, raise double the present revenue of France.

"It is also worthy of remark, that in Russia more than a third of the whole revenue is derived from the brandy farms; which, when the low price at which it is sold, the profits of the brandy farmers, and the produce of illicit distillation, are taken into account, suppose the consumption of a prodigious quantity of ardent spirits. If we turn to Prussia, which is often cited as a specimen of model administration, we find twenty-four pints of distilled liquor the share of each individual; whilst in Ireland, the land of whiskey, the average—nine pints, before Father Mathew's reign—is since only seven: and in the United Kingdom, including London, with its gin palaces, something under six and a half. If a line be drawn through Europe, separating the Western and Constitutional from the absolutely governed states of the centre and east, it will be found that British exports to Holland, Belgium, Spain, Portugal, and France, notwithstanding the restricted tariffs of France and Spain, average three shillings for each individual, whilst for Central and Eastern Europe, only one shilling and eight pence. To the Russian empire, British exports are eight pence and a fraction for each inhabitant.

"These are certainly curious statistics, and we should like amazingly to contrast them relatively with similar ones respecting the economy and commerce of the United States."

4.—UNITED STATES TERRITORY.

Table showing the estimated surface of the Territories of the United States north and west of the regularly organized states of the Union, and the portions of territory thereof situated north and south of the parallel of 36 *degrees* 30 *minutes north latitude.*

Territories.	Situated north of parallel 36 deg. 30 min.		Situated south of parallel 36 deg. 30 min.		Total.	
	Sq. miles.	Acres.	Sq. miles.	Acres.	Sq. miles.	Acres.
OREGON TERRITORY.—Bounded on the north by the parallel of 49 deg. north latitude, south by the parallel of 42 deg. north latitude, east by the Rocky Mountains, and west by the Pacific Ocean	341,463..	218,536,320..	— ..	— ..	341,463..	218,536,320
TERRITORY NORTH AND WEST OF THE MISSISSIPPI RIVER.—Bounded on the north by 49 deg. north latitude, east by the Mississippi river, south by the state of Iowa and the Platte river, and west by the Rocky Mountains	723,248..	462,878,720..	— ..	— ..	723,248..	462,878,720
WISCONSIN TERRITORY.—East of the Mississippi river, and north of the state of Wisconsin—being the balance remaining of the old Northwest Territory	22,336..	14,295,040..	— ..	— ..	22,336..	14,295,040
INDIAN TERRITORY.—Situated west of the states of Missouri and Arkansas, and south of the Platte or Nebraska river, held and apportioned in part for Indian purposes	190,505..	121,923,200..	58,346..	37,341,440 ..	248,851..	159,264,640
TERRITORY IN UPPER CALIFORNIA AND NEW MEXICO.—West of the Rio Grande to its source, and of a meridian line thence to the 42d degree north latitude, ceded to the United States by the treaty with Mexico of 1848	321,695..	205,884,800..	204,383..	130,805,120..	526,078..	336,689,920
	1,599,247	1,023,515,080	262,729	168,146,560	1,861,976	1,191,664,640
Add the territory which lies east of the Rio Grande and north of El Paso, up to latitude 42 deg. north, and outside of the limits of Texas, as shown on Disturnell's Map	43,537..	27,863,680..	81,396..	52,093,440..	124,933..	79,957,120
	1,642,784	1,051,378,760	344,125	220,240,000	1,986,909	1,271,621,760

The estimates of the above table were made by the Commissioner of the General Land Office, and furnish the most accurate and authentic information. From them two proportions may be derived, showing the relative amount of territory north and south of the Missouri Compromise line, or parallel of 36 degrees 30 minutes north latitude.

Excluding all the territory claimed by Texas, as in the first division of the table. The territory north of latitude 36 deg. 30 min.: the territory south of 36 deg. 30 min. :: 6.08 : 1.

Including the territory which lies west of the boundary of Texas, as designated on the map of the recent treaty with Mexico, east of the Rio Grande, and north of El Paso. The territory north of latitude 36 deg, 30 min.: territory south of 36 deg. 30 min. :: 4.77 : 1.

Adopting the comparison which shows the least disparity, it appears that, if the line of the Missouri Compromise were extended to the Pacific, there would be more than four times as much of the territory lying beyond the limits of the organized states, upon the northern as upon the southern side of that parallel.

5.—THE ARMY IN MEXICO.

The following table was made up for the New-York Sun, from official data. We published in our July number a table of the soldiers furnished by different states, in the Revolution. A writer in the Philadelphia North American conceives that we gave too great a preponderance to the north, whose soldiers enlisted often, and for very short periods. This does most materially affect the case, and we are obliged to the writer for the correction.

From Non-Slave-holding States.

		Men.
Massachusetts	1 Reg.	930
New-York	2 "	1,690
New-Jersey	1 Bat.	420
Pennsylvania	2 Reg. and 3 Com.	2,117
Ohio	5 " and 3 "	5,334
Michigan	1 " and 1 "	970
Indiana	5 "	4,329
Illinois	6 " and 1 Bat.	5,971
Wisconsin	2 Com.	146
Iowa	3 "	229
Total from the free states		22,136

From States South of Mason and Dixon's Line.

Maryland & D. C.	11 Com	1,274
Virginia	1 Reg.	1,182
North Carolina	1 Reg	895
South Carolina	1 Reg	937
Georgia	1 Reg. and 12 Com	1,897
Alabama	3 Reg. and 13 Com	2,981
Mississippi	2 Reg. and 1 Bat	2,235
Louisiana	7 Reg., 4 Bat. and 1 Com.	7,041
Tennessee	5 Reg.	5,090
Kentucky	4 Reg.	4,694
Missouri	69 Com.	6,441
Arkansas	16 Com.	1,312
Florida	4 Com.	298
Texas	99 Com.	6,955
Total from the south		$43,213

6.—MASSACHUSETTS ENTERPRISE.

We copy from the Boston Courier the following interesting statistics.

Fifty years since, the Middlesex Canal, costing but half a million, was considered a vast undertaking, and required twenty years for its completion; but since June, 1846, we have commenced and nearly built up from a desert the new city of

Lawrence; constructed new streets and factories at Manchester, Lowell, Riddleford, Blackstone, Lancaster, Worcester, Springfield and Fitchburg; the foundations of a new factory city at West Springfield; made a great aqueduct for Boston; contributed at least seven millions to the war loan; purchased a large part of the Michigan Central, and Wilmington, MadRiver, Housatonic, Reading and other railroads out of the state; enlarged and improved all the great routes out of Boston; constructed new lines to Wareham and the Cape, Bridgewater, Milton, Fall River, Blackstone, Milford, Greenfield, Athol, Lawrence, Gloucester, Woburn and Medford, and many cross lines in our own state; and greatly advanced or finished the Northern Passumpsic, Vermont Central, Montreal, Vermont and Massachusetts, Cheshire, Rutland, Sullivan, Ogdensburg and Kennebec railroads—in all nearly 800 miles of new track, opening to us the interior of New Hampshire, Maine, Vermont, Northern New York, Lakes Champlain and Ontario, and the Canadas.

Subjoined is an estimate of the amount our citizens have embarked in a few leading enterprises, principally since the spring of 1846, viz:

In factories and manufacturing cities on the sites enumerated	$13.000,000
Purchase of railroads out of the state	8,000,000
Expansion of old lines of railroad	6.000,000
Construction of new railroads in Massachusetts	7,000.000
Construction of new lines out of the state	12,000,000
Boston aqueduct, estimated cost with reservoirs and dead interest	4,000,000
Stock taken in United States loan	7,000,000
Total	$57,000,000

Amount unpaid less than $7,000,000, July 20, 1848. Estimated dividends to be received by citizens of Massachusetts, June to April, 1849:

From Banks	$2,000,000	Accumulation savings banks	$1,000,000
United States Loan	400,000		
Railroads	3,000,000	Total	$10,000,000
Factories	3,000,000		

The valuation of the state for 1848, if the increase of value in Boston and its vicinity be any criterion, must exceed $450,000,000, and the annual accumulation can be little short of $22,000,000.

7.—GRANITEVILLE AND VANCLUSE.

These thriving manufacturing villages in South Carolina have been lately described by Thomas Maxwell Esq., in the Tuscaloosa Monitor.

On the following morning, the 30th, we arrived at the inclined plane at Aikin, on the South Carolina rail-road, where we stopped for the purpose of visiting the Graniteville and Vancluse manufacturing establishments. We soon procured a carriage, and a nice ride of six miles over a hilly country, brought us in sight of the beautiful valley in whose centre lay the charming new built town of Graniteville, owned by the Graniteville manufacturing company.

This company was formed some three or four years ago by gentlemen of South Carolina, desirous of demonstrating the perfect practicability of the south manufacturing her own cottons, and diverting a portion of her labor from agricultural to manufacturing pursuits; and in order to make this labor (which is comparatively new to South Carolina) as attractive as possible, and to guaranty a respectable manufacturing population, it was determined that no pains or labor, or capital, should be spared to make this queen valley to "blossom like the rose," and to construct the dwellings of the operatives so that they should have all the comforts, conveniences and enjoyments of life at their command. Under the auspices of Mr. Gregg, this beautiful and philanthropic design is being carried out with extraordinary skill. When Graniteville burst upon our view from the summit of the hill, its main building of white granite, 350 feet long, with two massive towers ornamented at the top, looking like some magnificent palace just rising out of the green vale below, with an extensive lawn in front, and clean trimmed, gravel walks around, and fountains spouting their crystal waters in the air in fantastic shapes; the neat boarding-houses and cottages for single families, and the handsome little church, all constructed and ornamented in the ancient Gothic style, and each house having its own garden for vegetables and flowers; and the evergreen woods sloping from their garden doors gradually to the summit of the hill where we stood—the whole scene is as though the wand of the enchantress

had called it into existence to challenge our admiration. The extent of the valley below us looked as though it might be 12 to 15 miles in length, though it may be more. On the right at the head of the vale we caught a glimpse of the large pond or small lake from which a canal is cut and conducts the water on the hill slope to the establishment, a mile or so below. Turning to the left we descended the hill, crossed a nice bridge over the canal and entered the enclosure of the principal works. We crossed over to the opposite side, leaving the noble granite building on our right and the lovely green sward on our left, a fountain was throwing up a jet of clear water 15 feet into the air, which was quite refreshing to look upon. We entered the office and presented to Mr. Gregg our letter of introduction. Mr. Gregg was exceedingly polite in showing us everything about the establishment, every part of which was quite interesting to me. The shafting of the whole building was just completed, and Mr. Gregg had it put in motion for our benefit. It ran truly and steadily as possible, not a wabble was to be seen in the whole length. 300 looms were just being put into their places, and the spinning frames, carding machines, &c. &c., were being arranged to cover the whole building. I remarked to Mr. Gregg that I was glad they had not committed the error of only filling a portion of the mill at the commencement. He replied that that was an error he had been determined from the beginning not to commit, as he knew that to fill the mill at the start was the only way to insure success, and that the only condition on which he would have undertaken its control was that capital sufficient for that purpose, should be first subscribed. This had been done. The capital of the company is three hundred thousand dollars, and when all is completed and the full mill set in motion about next October, he says he will have money sufficient left to purchase cotton for a beginning. The mill will contain 300 looms and 9000 spindles, making No. 14 yarns, and sheetings, shirtings, quality to the Appleton goods; a market for which is expected to be found principally in New York. The machinery cost, exclusive of shafting, &c., about $90,000. The mill and its contents will cost about $150,000, and the making of the canal, the erection of boarding-houses, cottages, warehouses, shops, &c. &c., including $10,000 paid for the valley itself, will swallow up most of the other investments. The factory will be propelled by a turbin wheel of one hundred and sixteen horse power, of four feet diameter, with a tube of three feet, and apparently about 20 feet fall. The machinery is all of the most perfect and beautiful kind, and is principally from Taunton, Massachusetts. The whole valley at this point was altogether in the woods four years ago; and to look at it now with all of its improvements tending towards completion, shows with what energy and correct design every part has been prosecuted by the worthy manager. All along the banks of the canal, and facing the factory building, are very handsome houses built with strict uniformity, each having its garden and all other conveniences around it, intended for boarding-houses, and can accomodate besides the family, some ninety boarders with comfortable rooms, &c., and further on, and on the hill slope, nestling among the trees, are numerous cottages, with their peaked roofs, gothic windows and ornamented eaves, each part finished in the old gothic style. These houses are intended for families where the members are sufficiently numerous to fill one house and live alone. Mr. Gregg told us that these cottages thus ornamented, only cost the company $400 each, and that the ornamented work was only a small portion of that cost; while it was intended to give to the inhabitants a taste for the beautiful, and to encourage among the operatives a pleasant rivalry in making their homes agreeable. For this design the company are certainly deserving of all praise. It is not expected that this establishment will pay a dividend for the first two or three years, so large a portion of the capital is laid out in these improvements for the benefit of the people to be employed, and in constructing the canal, &c.

Being desirous of seeing Vaucluse, which is some three miles above, near the head of the valley, and is owned at present by Gen. Jones, a brother-in-law of Mr. Gregg, and was formerly owned between them, I took leave of Graniteville and proceeded through the woods to that secluded spot with its romantic but not inappropriate name. Here again we found our letter of introduction all powerful in opening to us the kind attentions of the worthy proprieter of Vaucluse. And though we had but little time to stay, having to return to Aikin before night in order to take the cars to Charleston in the morning, yet we improved that

time in going all over the establishment. It is a small mill completely filled with machinery, having 40 looms in motion, and making more yarns than is made into cloth. These surplus yarns are sold principally in New York. The 40 looms have been making osnaburgs, but at present are making choctaw stripes from nankeen cottons, the filling being all white, and the warp half white and half nankeen cotton. This dispenses with the process of dying any portion of the warp. The goods makes excellent negro clothing, and is sold at about 7½ to 8 cents in New York and Charleston. The machinery is old and old fashioned, yet under the management of Gen. Jones, who has a most perfectly systematic mind which controls all things well, the establishment is making money. Nothing could exceed the nice precision with which all the operations of the mill are managed. There is not an operation of the mill from the time the cotton is taken from the bale and winnowed until it is made into cotton or yarn, but the cost of each particular process for every day and week is ascertained to the thousandth part of a mill, and regularly entered in a book properly ruled and headed for that purpose, so that every Saturday night or Monday morning you can see at a glance the cost of every yard of cloth and every pound of yarn that was made the previous week. And so perfect is the system, that it is but little labor to keep it correct. The overlooker of each room has a book thus ruled, and he enters every operation under its proper column every day, and the clerk copies from these books the gross amount under each head, at the end of the week, in his book similarly ruled; and on a Saturday night or Monday morning it does not take more than an hour to make the entries, and by this means the operations of the mill can always be seen at any moment in a bird's-eye-view. Gen. Jones bought out the interest of Mr. Gregg last January, valuing the establishment at $32,000. The looms make about 45 yards per day. One girl generally attends three looms, and they are all paid by the piece. Indeed, throughout the whole establishment, wherever the operation can be paid by the piece it is done, and the proprieter derives great advantage from this arrangement, as the mill is more productive from the same investment under this rule. Besides, superior skill and industry in the operative meet its proper reward.

Gen. Jones was exceedingly kind in showing us every thing about the place, and even entered into particulars to show his profits without the least reserve. In making these choctaw stripes for instance, we found that his cloth the previous week cost him two cents and eight mills per pound to manufacture; his white cotton cost five cents, and his nankeen cost 8 cents. One-fourth of the goods therefore being nankeen, the average cost of his materials is 5 3-4 cents per pound, but say six cents, for even numbers, and say for even numbers that it cost three cents to manufacture it into cloth, instead of 2 cents and 8 mills per pound, thus we find that every pound of his cloth cost him 9 cents, and as his goods are just 8 ounces to the yard, it follows of course that his choctaw stripes cost him 4 1-2 cents per yard, and these are sold at 7 1-2 to 8 cents, which shows a handsome margin for commissions, profit, &c.

8.—PORTO RICO—EXPORTS FROM PONCE, P. R., TO 31ST AUGUST, 1847 AND 1848.

	Sugar, lbs.		Molasses, gals.	
	1848.	1847.	1848.	1847.
To America	13,444,362	15,256,982	781,497	505,129
Great Britain	2,851,834	3,777,037	73,505	425,948
British Provinces	1,099,237	1,432,194	34,175	79,435
Different Ports	1,548,515	868,639		6,872
Total	19,143,948	21,334,852	889,177	1,017,384

9.—REVOLUTIONARY SERVICES OF THE STATE.

A writer in the *Philadelphia North American*, calls our attention to a table we published in July last, which he regards as doing injustice to the Revolutionary services of Southern and Middle States. The table was made up on the authority of Seybert, and only includes the troops of the regular army. We have now, with the greatest pains and labor, made up the following results, which do justice to every section of the Union. They are given on the authority of General Knox, Secretary of War in 1790. (See American State Papers, Class V., vol. I.) The south will have no reason to blush for the results.

	1775	1776	1777	1778	1779	1780	1781	1782	1783
New-Hampshire..	2824	4019	4483	1783	1222	1767	700	744	733
Massachusetts	16444	20372	12591	13437	7738	7889	5298	4423	4370
Rhode-Island	1193	1900	2048	3056	1263	915	464	481	372
Connecticut.....	4507	13227	6563	4010	3544	3689	3921	1732	1790
New-York	2075	5344	5332	2190	3756	4838	1178	1198	1169
New-Jersey	—	9086	2908	2580	1276	1267	823	660	676
Delaware.....	—	754	1299	349	317	556	89	164	235
Maryland.....	—	3329	7565	3307	2849	2065	2107	1280	974
Virginia	3180	6181	11013	7836	7573	6986	6119	2204	629
North Carolina...	2000	4134	1281	1287	4920	6132	3545	1105	697
South Carolina ...	4000	6069	2000	3650	4500	9132	3000	3152	139
Georgia.....	1000	2300	2173	3873	837	1272	750	1326	145
Pennsylvania.....	400	10395	9464	3684	3476	3337	1346	1265	1598
Total.....	37623	89651	68720	51052	41584	42826	29346	18006	13476
South of Penn....	10180	22013	24032	20033	20679	26187	15521	9067	2594

1175.—The numbers are those in Continental pay. The Virginians were 6 and 8 months' men, and state troops; the North Carolinians were 3 months, and Georgians 9 months. All others enlisted to 31st Dec. 1775.

1776.—The returns are actual, and approximate and include militia and continentals. 8000 of the men from northern states, averaged but 4 months; 7000 from the Carolinas averaged 6 and 8 months.

1777.—Includes militia and continentals. 1113 New-Hampshire men were for 3 months, 2200 for 2 months; 2775 Massachusetts, 3 months, 2000 2 months; 1500 Rhode Island men, for 6 months; 2000 Connecticut, 2 months; 1500 New-Jersey, 2 months; 2481 Pennsylvania, 5 months, 2000, 3 months; 3420 New-York, 6 months; 1000 Delaware, 2 months; 1535 Maryland, 3 months, 4000 2 months; 1269 Virginia, 5 months, 4000, 2 months; 350 South Carolina, 8 months.

1778.—Includes militia and continentals. 500 New-Hampshire militia were for 2 months; 4500 Massachusetts, 2 months; 1000 New-Jersey, and 2000 Virginia, 2 months; 2000 South Carolinia, 3 months; 2000 Georgia, 6 months; part of Massachusetts and Virginia militia were for guarding Convention.

1779.—Includes militia and continentals. 1500 New-York militia, for 3 months; 3000 Virginia, 2, 1000, 6 months; 1000 North Carolina, 8 months; 4500 South Carolina, 9 months.

1780.—Includes militia and continentals. 2000 New-York militia, for 2 months; 1500 Virginia, 12, 3000, 3 months; 3000 North Carolina, average 12 months; 5000 South Carolina, average 4, 1000, 8 months.

1781.—Includes troops and militia. All the Massachusetts and Connecticut men are enlisted for 4 months.

1782.—South Carolina militia, for 4 months.

1783.—All continentals. Army at the north discharged 5th Nov., 1783; at the south, 15th Nov., 1783.

REMARKS ON THE WHOLE.

Supposing the average period of enlistment for all the years to be about the same, north and south, it will be seen that in the first years of the Revolution, when the war was chiefly at the north, the southern states supplied, each year, about one-

third of the whole number of enlistments; as soon, however, as the war extended southward, and became general, the southern states rapidly advance, supplying one-half; and for 1780, 1781, and 1782, *more than one-half* of all the enlistments. Mr. Seybert refers to a paper presented to Congress in 1811, which shows the regular troops raised in the revolution; number servicable in camp, and expense of the army.

	1775	1776	1777	1778	1779	1780	1781	1882	1783
Total men..	27443	46891	34820	32899	27699	21015	13292	14256	13476
Service'le in camp..	15000	25000	26000	1900	18000	19000	10000	11000	12000
Expense.....	$20,064,666	24,986,538	24,986,538	10,794,625	3,000,000	1,942,462	3,631,745	3,775,063	

Total expenses pecie, including sundry items.....$135,103,703.

10.—STATISTICAL SOCIETIES.

We are most delighted to clip this from the Galveston News, and cheer our friends of Texas on in their labor; our sympathies are all that way.

At Goliad on the 12th day of August, A. D., 1848, the Goliad Statistical Society was organized and the following Committees appointed:

1st. on Finance and Accounts.
2d. on the Library and Cabinet.
3d. on the general state of Religion and Morals.
4th. on Literature and Education.
5th. on History and Biography.
6th. on Animated and Vegetable nature.
7th. on Geography and Topography.
8th. on Geology and Mineralogy.
9th. on Agriculture and Grazing.
10th. on Manufactures and Mechanical Arts.
11th. on Commerce and Population.
12th. on Correspondences.
13th. on Enrollments, Revisions and Publications.

The several Committees will have charge of the subjects indicated by their names respectively, in the broadest application of the terms; with instructions to report thereon from time to time, using care to ascertain facts with precision. Communications are respectfully solicited through the several Committees, who may be addressed at Goliad by their respective names.

The South-western portion of the United States with the adjacent country, has already excited much interest throughout the Union, and other parts of the world. But its resources and capabilities are but little known, even to those who reside in this region; and of course, less is known generally by those persons at a distance. Superficial observation—inadequate experiments, and real peculiarities, in this highly interesting country, have all tended to diversify opinions, to distract information, and to suppress knowledge concerning it. Hence the importance of concentration, and certainty; and hence the institution of this Society. Some may consider such an Institution as premature in this country at this time, yet others argue more considerately, in favor of the earliest date as the best, because there is a present and pressing demand for the truth, and the whole truth, so far as may be attainable. The members of this society have no pretensions to enlighten others by their own present knowledge—they look to future acquisitions for themselves, and for others through the organization of the society, and particularly its committees. They hope thus to elicit from others, from time to time, much useful and interesting information, which may then be communicated to the public in a manner entitled to confidence. If liberally aided, the Society may be the instrument of much good, and whatever it may accomplish of real value, will be so much done in the line of utility and improvement.

YIELD OF SACCHARINE LIQUIDS.

THE METHODS EMPLOYED TO ASCERTAIN THE QUANTITY OF SUGAR CONTAINED IN SACCHARINE LIQUIDS.*

The only variety of sugar ever found in healthy cane-juice, is that to which, in consequence of its being entirely crystallisable, that term has been prefixed. We must now inquire into the means usually resorted to, to ascertain its amount in any liquid in which it may be contained.

The first to be mentioned, from its being the one most generally adopted, consists in ascertaining its specific gravity as compared with that of some other with which we may be familiar. Water being the one usually fixed upon for the purpose, we arbitrarily attach to it the specific gravity of 1000.

It has been shown, that the specific gravity of anhydrous sugar is, compared with that of water, as 1600 is to 1000. But as, in the state in which it exists as a vegetable principle, it is found combined with 5·3 per cent. of basic water, and also, as saccharine solutions always occupy a larger space than that of its two constituents when separate, in consequence of the expansion of the sugar in these cases, and which varies from 1·15 to 1·40 of its original bulk, according to its purity and crystalline structure, it follows that the real density of the refined sugar of commerce must be below that which these figures indicate, being about 1500; according to Biot, 1509.

As the amount of the other constituents of *cane-juice* is relatively small, its density is a test of the quantity of sugar which it contains, sufficiently accurate for all practical purposes.

To ascertain the density of a fluid we must provide ourselves with a pair of scales of good workmanship, and which are carefully adjusted, a set of accurate weights, and a glass bottle of such a capacity, that when filled so as to correspond to a mark or ring scratched upon its neck, it will contain exactly 1000 grains of distilled water at 60° temperature. The bottle, accurately poised by a weight in the opposite scale, is to be filled to the mark with the liquid, which is then to be carefully weighed; the weight is the specific gravity.

Although this is the most accurate method of arriving at the density of a liquid, it is too tedious to be used in the arts, and for all practical purposes the hydrometer may be safely substituted for it. This instrument is, I presume, too well known to require explanation; but as a few of my readers may not recognise it by that name, I may remind them that it is the one usually employed to ascertain the strength of rum or any other spirit. Two scales have been attached to it, in the one the specific gravity of distilled water being reckoned at 1000, the degrees rise above or fall below that number. The figure, which is on a level with the surface of the liquid in which the instrument is immersed, indicates the specific gravity. The other scale is the one generally in use in sugar manufactories and refineries in Europe; and a hydrometer so adjusted is commonly called Beaume's saccharometer. On this scale water is marked as 0, or zero, and each of its degrees comprises seven or eight of those on the former; the results obtained by it are, consequently, not so accurate. They are, however, sufficiently so for ordinary purposes; and in one respect this scale possesses great advantages, for owing to a variety of causes, which have been partly explained, the relative proportions of sugar and water, in different solutions, observe a tolerably close connection with the numbers marked upon it, for each degree corresponds with about ·019 part of sugar in the solution, so that by multiplying the one into the other, the quantity of sugar is pretty accurately arrived at. For example, let us suppose that the density of the liquid examined is shown by the saccharometer to be 20°, then, 20 × ·019 = ·38, which indicates the number of parts of sugar contained in 100 parts of liquid. The real amount, ascertained by direct experiment, is 37, but the two are wonderfully close.

When the density of the liquid is below 20°—·018 is a better number to use as a multiplier: thus, if cane juice have a density equal to 11°—11 × ·018 = 198, or 19·9·10 is the per centage of sugar which it contains. In a solution of sugar and water of this density, the amount of the former, ascertained by direct experiment, is 20 per cent.

* From Dr. Evans of London.

When saccharine solutions contain any other foreign matter, it is evident the quantity of sugar cannot be arrived at by the same method. In such cases chemists frequently cause the fluid to undergo the vinous fermentation, and then determine accurately the quantities of alcohol and carbonic acid which are produced; but this operation presents too many difficulties to be undertaken by those who are not practically versed in chemical manipulations.

Some years ago the celebrated M. Biot discovered that solutions of sugar, examined by means of polarised light, gave different results, according to the quantity of this substance contained in the solution; and, also, according to the variety of sugar experimented upon. I know not how I shall be able to render what I wish to say upon this subject, intelligible to those who are unacquainted with the phenomena presented by light when it is polarised. The attempt, however, must be made, for the subject is one of considerable interest to the sugar manufacturer, as most unexpected results have been obtained through its means, and we have every reason to expect still further discoveries by its more extended application; moreover, it affords a method of great simplicity, and one which can be easily employed for ascertaining both the amount of sugar contained in the solution, and also its variety.

I am not aware that this method of examining sugar has ever been practised by the refiners or molasses boilers of England, but on the continent its employment has been extensive. To the colonial sugar maker it would be in the highest degree useful, as it would enable him to detect the catalytic changes so often mentioned at the moment they commence, and thus enable him to check them, or still better, to prevent their occurrence, by the exercise of due precaution.

If we take a piece of glass, one of the surfaces of which has been previously blackened by means of smoke or soot, and lay it on a table with its blackened surface downward, and then place near it a candle, in such a position that the light may fall upon it at an angle of 56° 45', the light thus reflected will be found to possess properties which it had not before. If the image of the candle on the glass be viewed through what is called a Nicholl's prism, that is a rhombic prism of calcareous spar, two images will be observed, each of which will present a different color; if we now rotate the prism, the images will likewise turn, the one round the other, until they arrive in that position in which the one shall be placed directly over the other, when both will present the color of the light from the candle. If we continue the rotation, not only are their colors found to change, but at length one of the images disappears altogether, at a certain determined position of the prism.

If a tube, constructed of any appropriate substance, be filled with a saccharine solution, and closed at both extremities by means of plates of glass, in such a manner that the fluid may be retained within it, and then be interposed between the image and the prism, we shall observe two images in the position in which we before saw but one; and on further rotation we shall obtain a new position, in which the double image will appear. The arc described by the rotation of the prism determines the amount of action of the substance interposed. Instruments constructed upon these principles can be obtained from any of the philosophical instrument makers. A scale is attached to them, adjusted to measure in degrees the rotating powers of saccharine liquids.

The rotating power of water being 0, if any power be observed it must depend upon some substance contained in it; and in pure syrups this must, of course, be sugar. The amount of the power is in direct ratio with the quantity of sugar; in other words, with the density of the syrup and the length of the tube.

The value of this instrument does not consist merely in showing the *quantity* of sugar contained in a pure syrup, for that could be ascertained by finding out the density of the syrup, but it enables us likewise to discover whether its density be owing to the quantity of sugar contained in it, or to some other substance which possesses a different kind of rotation. The results produced when a solution of cane sugar is thus examined, are seen to be effected by a rotation of the prism from left to right, and from above downwards; but if a solution of glucose or sugar of fruits be substituted for the above, the effects will be produced by a rotation of the prism in the opposite direction, that is from the right towards the left.

These effects, however, are not peculiar to the two varieties of sugar mentioned above, but they are also observed in many other substances; for instance, the effects observed on the examination of a solution of dextrine are, in many respects, similar to those described as occurring when a solution of cane sugar is submitted to the same mode of investigation, so that were these two bodies to be so mixed together as to form a solution of a density of 20°, we should be led into a serious error were we to trust to the results produced by the polariscope as indicative of the amount of sugar that it contains.

When we apply this method of investigation to cane-juice, we should remember that there is always present in this fluid a small quantity of dextrine. But when the

canes are healthy and mature, the quantity is so minute that its effects are insignificant, and the results produced may be attributed exclusively to the cane sugar. The amount of the latter substance may thus be very accurately ascertained.

If a syrup obtained from healthy cane juice and which is of such a density as to indicate that the amount of cane sugar which it contains is equal to 60 parts in 100, be, on examination by polarised light, found to possess a rotating power equivalent to that which would be produced by half of that quantity only, we should conclude that its powers of rotation have been disturbed by an admixture of some other substance which is possessed of powers of rotation in an opposite direction, and, in all probability, that this substance is glucose, which has been formed during the process of concentration, or previously.

Evaporation is very frequently employed as a means of ascertaining the amount of cane sugar contained in any solution. When the solution consists of pure sugar and water only, and when the evaporation of the latter is performed at the ordinary temperature of the atmosphere, this method may fulfil its purpose tolerably well. But in this case it is unnecessary, as the density of the liquid is a correct indication of what we wish to ascertain. When the evaporation is performed at a high temperature, the result obtained cannot be depended upon, from the risk of converting a part of the cane sugar into glucose.

The method usually resorted to by chemists, for ascertaining the amount of sugar contained in a given solution, is either the following, or one closely resembling it. Presuming that cane-juice is the saccharine fluid to be examined, a weighed quantity of it is filtered, and a portion of very strong alcohol, equal to half its bulk, is added to it; a flocculent precipitate immediately takes place, which is removed by a renewed filtration. The liquid is then placed under the receiver of an air-pump, into which is, at the same time, introduced a vessel containing a quantity of perfectly caustic lime. On the air being exhausted, the water, in consequence of the affinity which its vapour and the lime have for each other, is evaporated, while the alcohol remains. In the course of ten days or a fortnight, the alcohol becomes too strong to retain the sugar in solution, and this substance is, consequently, precipitated. The precipitate is then to be washed in strong alcohol, and, having been carefully dried, it may be weighed, and its amount ascertained.

An equally accurate result may be obtained by boiling and filtering the cane-juice, and then evaporating it in a shallow vessel, over a water-bath, until it has acquired the state of a very thick syrup. A small quantity of spirits of wine is added, and the two liquids are blended together. The mixture is then treated under the air-pump, in the way just described. This experiment does not occupy the length of time required by the former one, and it is equally effective.

Or the cane juice, having been boiled and filtered, may be concentrated in a shallow vessel, over a sand bath, at a temperature not exceeding 150°, or 160°, until it becomes almost dry. It may then be dissolved in boiling alcohol, and, after filtration, the solution is decantered into a bottle, which must be corked and laid aside until the crystals of the sugar are deposited. Although the results obtained by this mode of proceeding are said to be tolerably accurate, and although it is more generally practicable, from its not requiring the employment of an air-pump, I greatly prefer either of the two former, when they can be performed.

EDITOR'S ARM-CHAIR.

Our exchanges for the past month have come to hand, as usual, and we have only space to refer briefly to them.

1. Silliman's American Journal of Science and Art: New-Haven. $5 per annum. This work has reached fifty-six volumes, and is one of the most valuable repositories of scientific knowledge in the world. We notice the publishers offer complete sets for sale, which should be found in every respectable library. Among the papers in the present number are two of especial interest: "On the Indian Archipelago," and on "Gutta Percha."

2. New-Orleans Medical Journal and Charleston Medical Journal: Both of these works are now of highly established reputation, and are conducted by men of eminent professional ability. In the New-Orleans Journal there are

some papers upon *yellow fever* which deserve general study, and we shall extract from their statistics. In the Charleston work we note an elaborate article from the pen of Dr. Eli Geddings, one of the most erudite medical philosophers in our country.

3. SOUTHERN LITERARY MESSENGER: Richmond, Va.: $5 per ann. We have the Sept. No. This is an admirable miscellany, and is the oldest literary work at the south. Its present editor, J. R. Thompson, Esq., exhibits high qualifications for his office. His paper on the languages of Europe is learned and chaste. He also publishes a paper from Lieutenant Maury, on the "Dead Sea Exhibition." By the way, the editor is a little severe on the "Brothers in Unity," for omitting all reference to the *Southern Quarterly*, or himself. We, too, might have complained, had not our "brother" of the *Messenger* excluded us from all the laurels of the southern periodical press, with which we have been connected about five years. Perchance, however, he thinks us "nothing if not *statistical*," and he may be right in that.

4. BANKER'S MAGAZINE: Baltimore: J. Smith Homans. $3 per annum. The September number contains the usual variety of information in regard to banks, currency, finances, &c. It is now well established, and deserves the support of all the bankers and merchants of the Union.

5. WESTERN JOURNAL: August and September: St. Louis. $3 per annum. We have frequently referred to this excellent monthly, and have extracted in our present number from its pages. A paper on "Hemp" attracts our attention, which we would like to republish.

We are pleased to refer, in the same connection, to the *Mining Journal*, published in New-York; the admirable *Railroad Journal*, published in Philadelphia by our friend, Mr. Minor, who deserves every kind of success; *Niles's Register*, Philadelphia, and last though not least, to the *Literary Weekly Gazette*, published in Athens, Geo., by Mr. Richards, a gentleman well-known to the southern press. We have been delighted with his enterprize, and have watched its progress from the very beginning.

SOPHISMS OF THE PROTECTIVE POLICY: Translated from the French, by Mrs. D. J. McCord, of South Carolina, with an introduction, by Dr. Francis Liebert: Charleston: John Russel. Of this work Mr. Calhoun has spoken in the highest terms. We have read parts of it with the liveliest interest. Nothing can be more lucid and convincing. Our chief regret is, that we receive the work too late for an elaborate notice sooner than our next number.

"ANTI-ALARMIST AND CHARLESTON, in reply to the Objections to Railroads, by Anti-Debt." This pamphlet was published in Charleston, and is a most admirable exposition in regard to railroad enterprises. We shall notice and review it elaborately, if possible, in our next number. We have heard it attributed to the pen of our friend, Col. James Gadsden, of Charleston.

The Report of Hon. T. Butler King, on "Steam Communication with China," will be noticed in our next.

Our friend, Dr. Albert W. Ely's paper is at hand, and will soon appear.

☞ And now, reader, we have been compelled to publish a double number, as you see. The loss has been ours, and not yours. Remember us, we pray you, for our funds are very low, and ought, in all conscience, to be replenished forthwith, We appeal again to our subscribers to be prompt in this vital matter.